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Operator's Guide for SonaView: A Comprehensive Demonstration Side Scan Sonar Post Processing System: Version 8.25

Roger Neill

DSTO-GD-0177

APPROVED FOR PUBLIC RELEASE

DEPARTMENT OF DEFENCE
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ABSTRACT

The computer program 'SonaView' was written to provide a test and evaluation platform for evaluating a range of methods for post processing side scan sonar data. As part of the evaluative process, Royal Australian Navy personnel have been using the program operationally. This document is a detailed operator's guide which is intended to be used in conjunction with SonaView.

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Executive Summary

The Royal Australian Navy (RAN) maintains a side scan sonar based route surveillance capability. Route surveys are typically conducted as a two-stage process. The first, data acquisition stage is conducted from a survey platform such as an auxiliary minesweeper. The second, post processing stage is normally conducted at a shore-based facility. The intention is for the RAN to have a route survey post processing system linked with its Mine Warfare Systems Centre (MWSC). A commercially-sourced post processing system was purchased but, due to a range of circumstances, this unit has not been incorporated into the MWSC. Thus the exact form that the post processing system should take is still under consideration.

It was decided that the RAN would be better able to decide what form its post processing system should ultimately take if it had access to a demonstration system which could be relatively easily modified to suit the RAN's unique operational requirements. The program 'SonaView', which was developed as a result of that decision, was designed to meet four specific perceived operational requirements:

- That facilities should exist which allow the operator to make simultaneous or near-simultaneous use of both available sonar frequencies. This, combined with appropriate tools for the enhancement of the sonar images, results in optimisation of the efficiency of detection and classification of sea-bed objects
- That, when an ensonified object is marked as a target, sufficient information should be stored, or transferred to a geographic information system, to allow a subsequent reviewer to make judgements on the characteristics of the target and the quality of the detection/classification without having a need to revisit the original sonar data.
- That it should be possible to use the program to make an assessment of the quality of ground coverage in the survey; i.e. how well the vessel covered the specified tracks and how completely the sonar covered the required area.
- That facilities should exist to enable the operator to make relatively rapid re-assessments of previous post-processing analyses.

This report is the operator's guide for the program SonaView. It is intended that the program and the guide should be used together when RAN officers conduct their

operational evaluation of the demonstration platform. The guide gives detailed descriptions of all of the features of SonaView. It also provides detailed instructions of how to use each of these features. Finally, the guide provides the operator with a suggested methodology for the conduct of a post processing analysis of a survey mission.

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Roger Neill received a Science Degree with Physics majors in 1978 and a PhD in 1984. The subject of his doctoral dissertation was the development of new methods for evaluating human binocular visual function. He then did post doctoral work on this project until he joined DSTO in 1988. Upon joining DSTO Roger initially investigated the effects of flicker and clutter on target detection in screen-based equipment. More recently he has worked towards the development of improved methods for the operational use of the Royal Australian Navy's side scan sonar-based Route Surveillance System.

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Preface

This manual uses two different type faces throughout.

Normal text is presented in Times New Roman, like this.

Where an operator is required to type a series of characters on the keyboard, the required keys are printed in COURIER NEW,LIKE THIS.

Special characters such as the 'enter' key are presented between a pair of brackets, as follows: <ENTER>.

Where only one character is to be typed, this is illustrated by enclosing the character between single quotes as in 'X'.

Where two characters are required to be typed simultaneously, they are presented like <ALT>F.

Some menus require the operator to type two characters together, followed by a single character. For example to exit from SonaView, an operator types the 'Alt' key and the 'F' key simultaneously, followed by the 'X' key. This will be presented as follows: <ALT>F,X.

Generally the program is not case sensitive. Thus either a lower case or upper case key can be used to select a particular menu or option. The only notable exception is the Numeric Keypad at the right of the keyboard. Holding the <SHIFT> key while using any of these keys will result in very different actions than would otherwise occur! Any other exceptions will be notified in the manual below.

Acknowledgments

The author would like to give due credit to his colleague, Dr Stuart Anstee, who has had a very significant input to the development of the program SonaView. Not only has he provided a wealth of useful suggestions, he has acted as an uncomplaining 'beta tester' for the program. He has also made many useful suggestions regarding the format of this document, which is also appreciated

A number of Royal Australian Navy personnel have given me evaluative feedback during the development process. These included Lt Paul Scott, CPO Terry Oxley and Lt Andrew Fraser. Their comments were highly valued.

Chapter One: Introduction to SonaView

1.1 Background

SonaView started life as a piece of scientific development software, intended for use in a laboratory environment. The program was used as a trials-analysis tool and as a platform for the development of new techniques for processing sonar and navigation data. As time went on features were added to the program to make it easier to conduct the trials analyses. The result was that the program began to take on some of the characteristics of a piece of operationally-usable software. At this stage we started to liaise with Royal Australian Navy personnel to find out what features would need to be added to the program to make it an operationally-useful piece of demonstration software. Most of these features have now been incorporated into the program. *It must be emphasised that SonaView is a development and demonstration platform, it was not designed as a commercial package and should not be expected to operate as one.* It is recognised, however, that in order for a realistic assessment to be made of the potential operational usefulness of a demonstration program, it must have many of the characteristics of a commercially-derived package. This includes a reasonable machine-operator interface and an appropriate level of documentation. Every reasonable effort has been made to ensure that this program can be used successfully by Navy personnel who have had typical exposure to computer hardware.

1.2 Perceived operational requirements

The prime perceived operational requirement for SonaView is that it be an *effective* tool with which a route surveillance officer can conduct post-processing analyses of side scan sonar survey data. In developing a tool which meets this prime requirement, the following specific perceived operational requirements were addressed:

- That facilities should exist which allow the operator to make simultaneous or near-simultaneous use of both available sonar frequencies. This, combined with appropriate tools for the enhancement of the sonar images, results in optimisation of the efficiency of detection and classification of sea-bed objects
- That, when an ensonified object is marked as a target, sufficient information should be stored, or transferred to a geographic information system, to allow a subsequent reviewer to make judgements on the characteristics of the target and the quality of the detection/classification without having a need to revisit the original sonar data.
- That it should be possible to use the program to make an assessment of the quality of ground coverage in the survey; i.e. how well the vessel covered the specified tracks and how completely the sonar covered the required area.
- That facilities should exist to enable the operator to make relatively rapid re-assessments of previous post-processing analyses.

1.3 Some Specific Operational Features of SonaView

1.3.1 Dual-frequency capability

The Royal Australian Navy's side scan sonar data acquisition system (SIDA - Sonar Imaging and Data Acquisition System) has separate acquisition modules for the low (100 kHz) and high (500 kHz nominal) frequencies. The data from these modules are stored on separate optical disk storage media with a relatively clumsy cross-referencing system. Whenever a new set of optical disks are loaded into SonaView, the program undertakes a cross-referencing process on the disks so that the two frequencies can be re-played simultaneously. The operator then has a choice of switching between the frequencies or viewing a 'merged' image, which is generated using a unique, DSTO-developed algorithm.

1.3.2 Target marking capability

Once an object has been detected and the decision has been made to classify it as a target, SonaView gives the operator considerable flexibility in making the classification. The target can be marked as a relatively small, localised object, in which case its approximate dimensions are calculated, or as a feature with extended 'linear' characteristics, in which case its outline shape is stored. If there is an acoustic shadow present, then this can be utilised to estimate how far the object stands above the bottom. In every case SonaView stores considerable detail on the status of the sonar system, the navigation system and the survey, so that a reviewing officer should be able to make a judgement on the confidence which can be attributed to the classification without having to re-review the raw sonar data.

1.3.3 Tools for the assessment of ground coverage

SonaView has an extensive set of tools to help the survey officer make judgements on the relative completeness of a scheduled survey. The actual ensonified ground coverage of a survey can be superimposed onto a chart. Over the top of this can be overlaid a plan for the survey (runlines and waypoints). Thus the survey officer can see, at a glance:

- the occurrence and locations of missing parts of the planned survey
- how well the runlines were tracked
- any areas in which the navigation system was obviously in error
- the occurrence and location of any sonar 'holidays' within the survey

1.3.4 Tools for re-reviewing previously processed surveys

When a previously-processed survey is re-loaded into SonaView, the survey officer is provided with an 'Operations Plot' showing the locations and identification numbers of all previously-marked targets. Tools have been provided which allow the officer to very easily:

- re-play the sonar data which contains the ensonified image of any individual target
- display the details of any individual target
- delete a previously-classified target

1.4 The structure of this manual

This manual has been written in such a way that, by working through the manual, it should be possible for a prospective SonaView operator 'build up' his or her expertise with the program. While some experience with side scan sonar is assumed, no assumptions have been made about the familiarity of the operator with computer hardware or systems.

The manual begins with a series of general definitions which the operator will need to know before attempting to use SonaView.

Chapter Three then provides more specific definitions of data storage files and the manner in which they are created, saved or modified.

Each of the following chapters then addresses particular aspects of the operation of the program.

Finally, a 'quick guide' has been provided. This assumes that the operator is familiar with the operation of the program, but may need reminding of the specific steps which need to be taken to initiate the various functions.

Appendices and an Index are provided to help the operator find answers to specific questions.

Chapter Two: Definitions and Descriptions

2.1 Display Screens

2.1.1 Screens and Windows

The Program uses two display screens to present data. The first screen is devoted to the display of sonar information, and the second is used to present navigational and other operational data. The *Sonar Screen* is divided into two windows, the *Sonar Display Window* and the *Sonar Status Window*. The Sonar Display Window is used to present the actual sonar data, in any of a number of configurations. The Sonar Status Window presents information on the status of the sonar system at the current cursor location. The *Control Screen*, which is the normal computer display, is also divided into two windows. The first is called the *Navigation (or Nav) Window* and it is used to give a geographical representation of the survey area. The second window is known as the *Parameter Window*, and it is used to display a wide range of operational data and program menus.

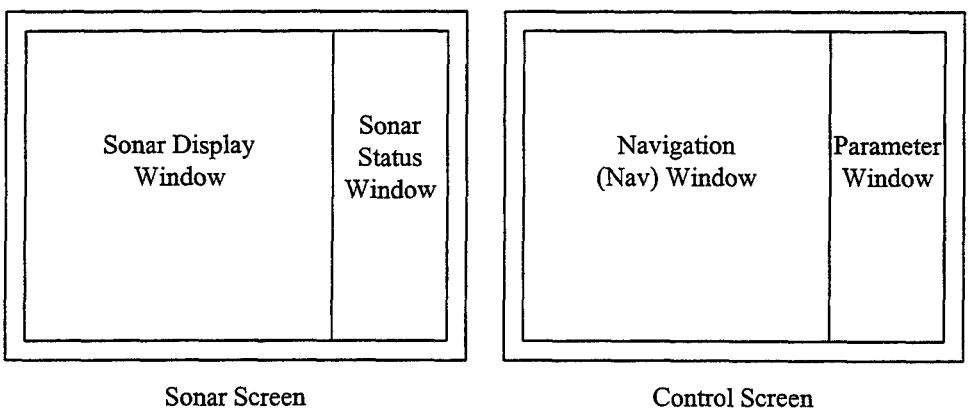

Figure 2.1 SonaView's physical display screens and windows

2.1.2 The Sonar Display Window

This window is 1024 pixels wide and 1024 pixels high. The sonar data is presented as a waterfall display, one row of pixels per sonar ping. At a typical towing speed of 4.5 knots and a range setting of 100 metres, a screen-full of data typically runs about 300 metres along the track.

A cursor, which is a red cross-hair on the Sonar Screen with a red dot in the centre, is used to define the current point of focus of the program. The information which is displayed in the Sonar Status Window gives the navigational and other information for the point which is at the centre of the cursor.

2.1.3 The Sonar Status Window

2.1.3.1 Parts

This 256 pixel wide window extends down the right hand side of the Sonar Screen. It is divided into a number of parts. At the left of the window, next to the Sonar Display Window, there is a thin vertical strip of pixels called the *Navigation (Nav) Status* area, which scrolls with the Sonar Display Window. The rest of the window is stationary. Some other areas on the window are the *Next Record* area, the *Cursor Data* area and the *Zoom Window.*

2.1.3.2 The Navigation Status Area

The Navigation Status field is a narrow strip immediately adjacent to the sonar display. This field scrolls with the sonar waterfall and gives an indication of the status of the navigation system at the time the sonar ping was transmitted. This is the equivalent to the SIDA navigation status indicator described in the SIDA Operator's Guide, Section 5.10. A black status field indicates that valid navigation updates had been received by the sonar system within a few seconds of the sonar ping. A purple status field indicates that the last navigation update was delayed by somewhat more than 10 seconds and a red status field indicates that there had been no navigation updates for more than about 30 seconds.

2.1.3.3 The Next Record Area

This indicates which sonar record should scroll into view next. This is useful for fault finding if there is a bad data area on an optical disk which causes the program to stall. It means that it is possible to take note of the bad record number, and attempt to jump past it in future.

2.1.3.4 The Cursor Data Area

This presents a range of information which applies to the point which currently at the cross-hairs of the cursor. The following information is displayed:

- 100 kHz record number, if there is a 100 kHz disk loaded
- 500 kHz record number, if there is a 500 kHz disk loaded
- Offset (range along the bottom) of cursor from the midline (red for port, green for starboard)
- Universal Transverse Mercator (UTM) projection Easting
- UTM Northing
- Pixel amplitude, which is a value from 0 to 255 (249 with the SIDA)
- Date of survey
- Time of survey
- Current ship's gyro reading
- Towfish Height, as calculated by the SIDA

2.1.3.5 The Zoom Window

About two-thirds of the way down the Sonar Status Window is a zoom window. This allows parts of the sonar image to be copied or zoomed for further inspection. Zoom options will described in Section 7.3.

2.1.4 The Navigation Window

This window presents a geographical representation of charts, planned and recorded survey tracks, sonar swathe coverage, SIDA contacts and SonaView target locations, current tow vessel position, current towfish position, current cursor position. The Navigation Window therefore presents an 'Operations Plot' for a survey. The data is presented as a UTM projection using the Australian Map Grid. The plot is always oriented in the same way, with UTM Northing increasing up the screen and UTM Easting increasing from left to right across the screen.

The sonar swathe coverage is represented by shading the sea-floor area which the sonar has ensonified. The vessel and towfish paths are represented as 'snail-trails' which are laid down as the vessel and towfish symbols move about the screen.

The display can be zoomed and panned, as detailed in Sections 6.2 and 6.3. Options which exist for selecting which data are presented on the Navigation Window are described in Section 6.7.

2.1.5 The Parameter Window

This is a multi-purpose window which lies down the right side of the computer monitor. This window displays all of the program's option menus and it can also be switched to display additional information which relates to the survey.

2.2 Keyboard and Mouse

2.2.1 The Keyboard

This is not a Windows™ program, *ie it does not use the mouse to control its menus.* The various menus are selected via the *keyboard.* The program is written so that the menus can guide the operator by pictorially showing which keystrokes are required to select the various menus.

Alternatively, a series of 'hot keys' are available. These allow an experienced operator to select some of the more frequently-required options with a single keystroke.

2.2.2 The Mouse

The mouse controls the sonar cursor. It allows the operator to move the cursor around the sonar screen. It also allows targets to be marked.

2.3 Menus

2.3.1 Menu Structure

SonaView currently has a menu structure which descends to a maximum of two levels below the main menu. The top level menu is simply a 'switch box' which directs the operator to select a sub-menu.

HITTING THE <ESC> KEY ENOUGH TIMES WILL TAKE YOU BACK TO THE TOP MENU LEVEL AND WILL PROBABLY GET YOU OUT OF TROUBLE.

Most functions are accessed from the first level sub-menus.

Each sub-menu can be reached from any other menu by typing its own <ALT> key instruction. Thus, for instance, one can move directly from the File menu to the Target menu by typing <ALT>T. The second level menus must be reached from the first-level menus. Each of the menus is described in detail in following chapters, however the functions of the program are grouped into the following first-level menus:

- File Menu: Used for opening and editing the files which SonaView uses.
- Move to Record Menu: Provides two methods for moving to different parts of the current survey.
- Sonar Display: Allows the operator to change the settings of the Sonar Screen.
- Control Screen: Allows the operator to change the settings of the Control Screen.
- Target Options: Gives a number of options which relate to SonaView targets.
- General Options: Miscellaneous commands.
- Revert to Work Window: Switches the menu off to allow the Work Window to appear in its place. Switching the Work Window on is the normal mode for analysis.

2.3.2 Active and Inactive Menus

There are occasions when a menu option must be disabled. For instance, if only the 100 kHz optical disk is loaded, then it is impossible to switch between sonar frequencies. In this case the menu item to switch frequencies becomes *inactive*. An active menu item is shown on the Parameter Window as a heading and an icon showing the relevant key, with both heading and icon coloured light grey. An inactive menu still carries the heading, but the diagram of the key is now only presented as an outline superimposed over the background colour. Pressing the key for an inactive menu item should have no result.

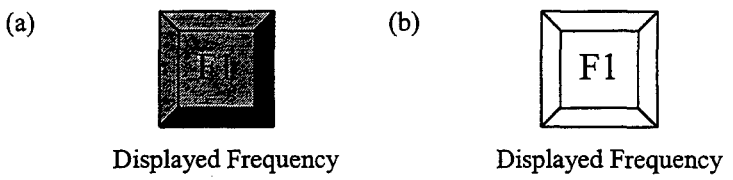

Figure 2.2 Illustrating (a) an active menu icon and (b) an inactive menu icon.

2.3.3 Radio Button Input Boxes

There are occasions when the operator will have many possible options to choose from. A radio button input box provides a relatively quick method for selecting a single option out of a large number of possible choices. For example, say there have been fifty targets marked and the operator wants to select the fifteenth target as the Current Cursor Referent (see Section 2.5). After choosing the Select New Target menu, an input box which looks something like Figure 2.3 will appear. To select a

new target the up or down arrows are pressed until the desired one is highlighted. In this case a single <DOWN ARROW> keystroke will bring up the desired option. Once the correct option is highlighted, or if the previous or next group of options are required, the <ENTER> key activates the command.

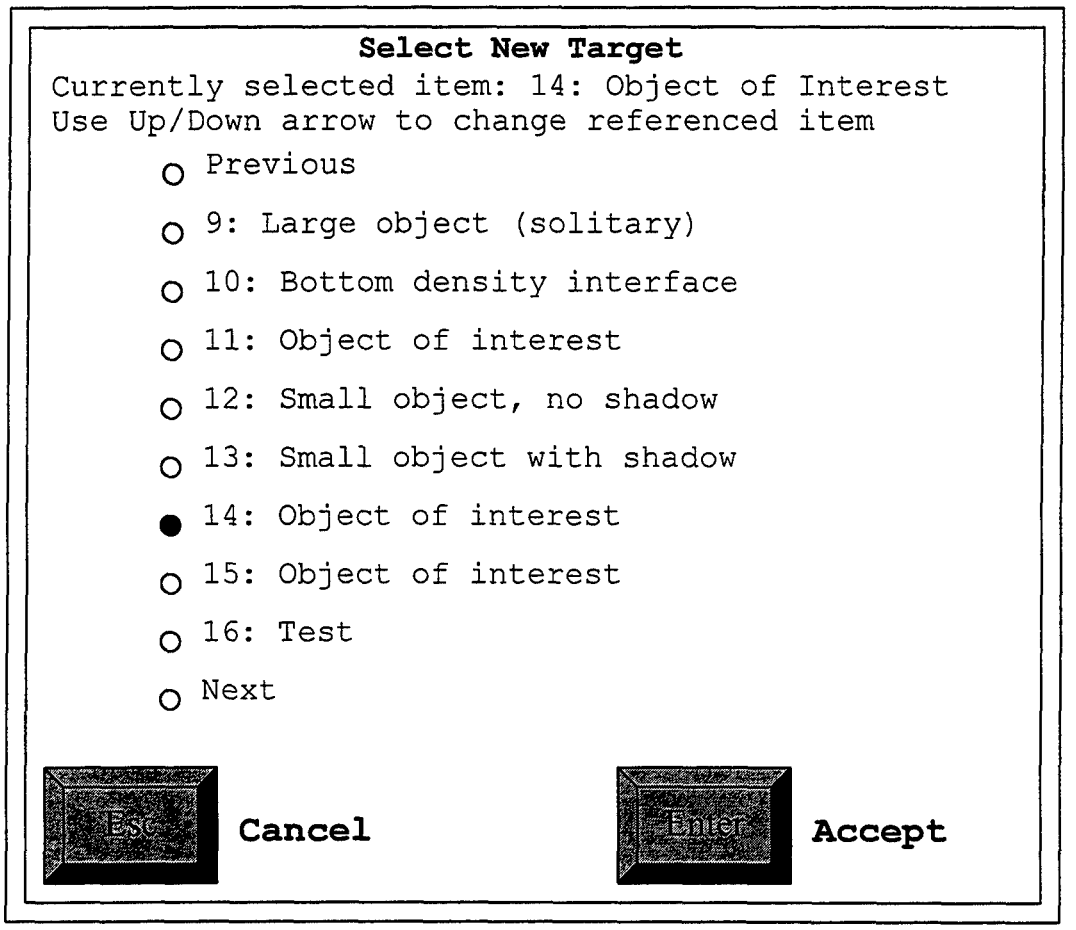

Figure 2.3 A sample radio button input box

2.3.4 Dialog Boxes

Some options require the operator to enter either a number or an alphabetical string as input to the program. Figure 2.4 is an example of a dialog box. In this case the operator is required to type a file name. As the characters are entered, the current position symbol (Shown here as a black box) moves across the input box. If an incorrect character is typed, then the operator must use the <BACK SPACE> key to delete back to the incorrect character. Once the input line has been satisfactorily completed, the command is activated by typing <ENTER>. For most of the dialog boxes it is possible to back out of the command completely. This is done by hitting the <ESC> key.

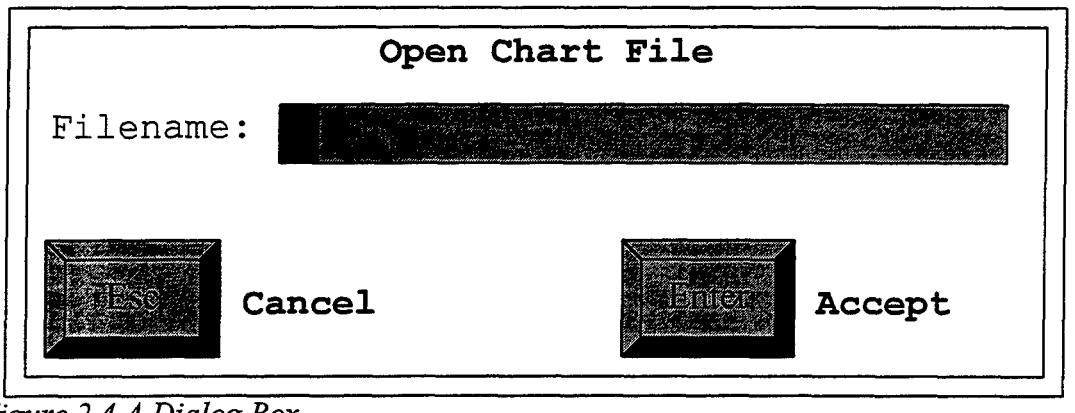

Figure 2.4 A Dialog Box

2.4 Contacts and Targets

2.4.1 Contacts

'Contacts' are defined as those locations which have been marked by the SIDA operators at the time of data collection. The contact details, including geographical location, are calculated by the SIDA system and stored on optical disk.

It should be noted that the positions calculated by the SIDA system are approximate only and so will not correspond exactly to the location calculated by SonaView if the same object is marked during post-processing.

The contact numbers are shown in white on the Sonar Display and Navigation Windows. The actual location of the contact is shown as a small white circle on the Navigation Window. On the Sonar Display window the contact number is printed below and slightly to the right of the contact. This is so that the image of the contact is not obscured by the number.

2.4.2 Targets

A 'target' is defined as an object which has been marked on SonaView during post processing. The details of marked targets are stored in a Target Output File, as detailed in Sections 3.3.7 and 9.2, 9.3. A target is illustrated in two ways on the Navigation Window.

- Point targets are shown as a square with lines across both diagonals: ⊠ .
- Targets which have linear extent, such as a bottom density interface, are shown as a dashed line.

Depending on their type, the targets are shown in a range of colours on the Navigation Window.

On the Sonar Display Window, however, the target number is always shown in red. In the case of a linear target, the target number is adjacent to the first marked point ('node') of the target. Once again, on the sonar display, the target number is shown below and slightly to the right of the target.

2.5 Cursor Referents

A cursor referent is an object, line or point on the Navigation Window against which the current position of the cursor is measured. It is possible to select individual Chart Objects, Wrecks, Waypoints, Runlines, Targets, or Contacts as cursor referents. This is particularly useful where an operator is trying to decide if a sonar 'hit' corresponds to a previously marked target or chart feature, which has been selected as a referent.

2.6 Dual-frequency 'Merging'

Many side scan sonars, including the Klein 595 which is currently used by the RAN, transmit simultaneous sonar pings at two different frequencies. In the case of the Klein, the frequencies are approximately 100 kHz and 400 kHz (although for some inexplicable reason Klein have always called this '500 kHz', a convention which will be maintained throughout this manual). It is not unusual to see conditions where the two frequencies are detrimentally affected by *different* noise sources. For instance the 100 kHz may be affected by surface reverberation effects while the 500 kHz is affected by electrical interference. Maritime Operations Division has developed a technique for 'merging' the outputs of the two frequencies. This technique looks for features which are common across the two images and it enhances them. Features which are not common to both frequencies are suppressed. The filter which performs this operation has been optimised for mine-sized objects.

The net result is that, in the merged image, small objects tend to 'stand out' more strongly from the background than they do in the individual sonar frequency images. While this has been shown to be the case in a large proportion of sonar 'hits' on known targets ('Merge' - A filter for the fusion of dual-frequency sidescan sonar data. R.A. Neill and S.D. Anstee (1997), DSTO Technical Report DSTO-TR-0511), the filter was never designed to replace the individual sonar frequencies. SonaView has been set up so that the operator can quickly and easily switch between all three sonar images: 100 kHz, 500 kHz and Merged, as is explained in Section 7.2.1.

Chapter Three: Files and Directories

3.1 Introduction

In displaying and processing sonar data, SonaView needs to read from and write to several different files. These files, which will be described below, include abstract files, abstract summary files, chart files, a configuration file, mission files, target-type descriptor files and target output files. SonaView uses a number of directories as its default locations to store some of these files. While these defaults can generally be over-ridden, it is probably safer to stick with them. It is amazing how quickly one forgets where various files have been stored!

3.1.1 What do 'Filename', 'Directory' and 'Path' mean in MS-DOS?

In MS-DOS each data file is assigned a filename. The filename is the label with which a particular file can be specified. A MS-DOS file can have up to eight characters in its name, plus a three character extension. Normally a file's extension is used to indicate what type of file it is. For instance, a document file often carries the extension 'DOC'. SonaView uses a number of default extensions (e.g. 'CHT' to indicate a *chart file*), each of which is defined below.

In the Windows™ environment, file management is based on a system of *folders*. To make a file easy to locate, it is assigned to a particular folder. The MS-DOS equivalent to a folder is called a *directory*. A disk is therefore broken down into a series of directories. Each directory can, in turn, have subdirectories. The net result is that the disk is organised into a tree-like structure called the *directory tree.*

The *path* specifies the location of a file within the directory tree. If a file is located on Drive C:, its directory is **\SURVEYS** and its subdirectory is **\1997**, then the file's full path is **C:\SURVEYS\1997**. Most of the files which SonaView needs to access have default paths. This means that, as long as the files are located in the correct place, the operator can open a file by typing the filename only - there is no need to type the full path.

The *current directory* is the directory or subdirectory to which MS-DOS currently points. Unless it is specifically told to look elsewhere, MS-DOS will read from or write to the current directory. It is necessary for the operator to set the current directory before SonaView is initiated. This is explained in Sections 3.2 and 4.*.

3.2 The Current Mission Directory

3.2.1 Introduction

The *Current Mission Directory* (hereafter called the 'Mission Directory') is the directory in which most of the data is stored that relates to the conduct of the mission which is currently under analysis. The directory will generally contain the *Mission File*, the *Abstract Summary File* and the *Target files*, each of which is described in Section 3.3.

3.2.2 Creating a Mission Directory

The system which is adopted for naming these directories is up to COMAUSMINDIVFOR. Let's say though, by way of example, that it is wished to use the directory name **AUS236** to denote missions which have been conducted in the (Brisbane) area covered by the chart of that name. To create a new mission directory, follow these steps

- Go to the root directory: `CD \<ENTER>`
- Make new directory: `MD AUS236<ENTER>`
- Go to new directory: `CD \AUS236<ENTER>`

It is not currently possible to change mission directories from within SonaView. To change directories one must exit SonaView, change the directory and re-initialise the program.

3.3 File Structure

3.3.1 Abstract files

3.3.1.1 Functional Description

Every sonar record on the SIDA optical disks has navigation information attached to it. With the navigation information spread over the whole disk in this way, it would be restrictively slow to perform some functions, such as displaying a summary of a survey's ground coverage or providing a facility for jumping to a new point in the survey. This problem is overcome by extracting each of the navigation updates from the sonar data and writing them into a separate Abstract file. As well as containing all of the valid navigation updates which are included on a SIDA optical disk, the Abstract files also contain information on the geographical extremities of the data included on the disk. The process of generating an abstract from an optical disk is colloquially known as 'crunching' the disk.

The default naming convention for the Abstract files is to name each file using the disk serial number, the side and a '.ABS' extension. Thus the abstract for side B of disk 12345 would be stored in file '12345B.ABS'. Normally the Abstract files are stored in the directory **\ABSTRACT**. This is the default location where SonaView looks for the disk abstracts. If the files aren't stored in this directory SonaView will not find the abstracts and consequently several of its features will be disabled.

A DOS-based program has been written to crunch the disks. In order that the abstracts end up in the correct directory, the operator must move to the **\ABSTRACT** directory prior to running the crunching program. The steps involved in changing to the correct directory and running the crunching program are described in the next section.

3.3.1.2 *Generating an Abstract*:
Use the following steps to generate an abstract:

- From the MS-DOS prompt (C:\) change to the abstract directory by typing:

```
CD \ABSTRACT<ENTER>
```

- Place the disk to be abstracted in the 100 kHz drive, and ensure that the other drive is empty
- Start the abstracting program by typing `ABSTRACT<ENTER>`
- The program then presents two information screens. The operator must hit `<ENTER>` to clear each of these screens.
- The program will ask whether you want to abstract the whole disk or a specific part of it. Generally you will take the (default) whole disk option by hitting `<ENTER>`.
- Occasionally the SIDA disks have faults, resulting in parts of them being unreadable. When the abstracting program hits a bad section, it stops and closes the abstract file. It is possible to use the alternative option, Read From Specific Records, to jump over a bad part of the disk and re-start the process further along the disk. If this option is used it is possible to build up an abstract of the disk by running the program several times, using the same abstract file each time. For instance a disk may have a fault in the region of records 12000-18000. The disk should then be abstracted from record 0 to 10000, then from 20000 to 110000. Make sure that the sequence follows an increasing record number order.
- When it starts a new disk and a new abstract file, the program will produce a header and interrogate the disk. If it has been able to read the disk successfully, it will suggest a name for the abstract file, e.g. 12345A.ABS. If this name is satisfactory, then you simply hit `<ENTER>`. If the program has suggested a name 0.ABS, then there has been a problem and you should try powering down the computer and repeat the process. It is possible to force the program to use a different name by simply over-typing the suggested name. THIS IS STRONGLY DISCOURAGED AS SONAVIEW WILL NOT KNOW WHAT FILENAME TO LOOK FOR WHEN IT ATTEMPTS TO LOAD THE DISK ABSTRACT.
- A full SIDA disk will typically have about 112000 sonar records and will take slightly over an hour to process.

3.3.1.3 Where SonaView looks for abstract files
When it starts, SonaView automatically attempts to load an Abstract File for the disks which are loaded in the optical drives. It always looks for the abstract files in a directory called \ABSTRACT. If there are both 100 kHz and 500 kHz disks installed, it will attempt to load the 100 kHz abstract first, and if it fails to find the 100kHz abstract file, it will look for an abstract for the 500 kHz disk. For each frequency the program looks for an abstract in the directory \ABSTRACT on drive C: first, then on drive A:, then on drive D:. That is, the search order is: C:\ABSTRACT, then

A:\ABSTRACT, then D:\ABSTRACT. This approach was adopted so that abstracts could be loaded off floppy disk, thus allowing SonaView to be operated in a non-secure environment. If it is wished to generate the abstract directly to floppy disk, then before following the instructions shown in Section 3.3.1.2, follow these additional steps:

- Place a floppy disk in Drive A:
- Change to the floppy Drive by typing `A:<ENTER>`
- Create a new abstract directory `MD ABSTRACT<ENTER>`

3.3.2 Abstract Summary Files

3.3.2.1 Full ground coverage of an extensive survey mission is likely to require more than one pair of optical disks. In order to represent the ground coverage of a full survey, it may therefore be necessary to display abstracts for two or more optical disks. SonaView has the option to present such a multi-disk abstract. The ground coverage of the currently-active disk is presented on the Navigation Window as a grey swathe, the ground coverage of the other disks is presented as a magenta swathe.

3.3.2.2 The file which determines which abstracts are included in this multi-abstract display is known as the *Abstract Summary File.* The summary file is normally located in the currently active Mission Directory. It is created outside of SonaView using a standard DOS editor.

There is no particular default extension for the summary file, but a suggested convention may be to give the summary file the same name as the Target Output File (see Section 3.3.7), but with a '.SUM' extension.

The file simply comprises a list of the names *and locations* of each Abstract file, one file per line. Thus the abstract summary file for a survey which used 100 kHz disks 12345A, 12345B, 12346A and 12346B will be created within a text editor (something like Microsoft Edit, NOT Microsoft WORD) by the following procedure, which should take place in the mission directory:

To start an abstract summary file called AUS236.SUM in the mission directory, type

```
EDIT AUS236.SUM <ENTER>
```

The "Edit" program will start, giving a blank blue screen. Now type in the abstract files for the mission, which will be:

```
C:\ABSTRACT\12345A.ABS<ENTER>
C:\ABSTRACT\12345B.ABS<ENTER>
C:\ABSTRACT\12346A.ABS<ENTER>
C:\ABSTRACT\12346B.ABS
```

To save the file, hit the <ALT> key, which will present a menu. Use the arrow keys to highlight `Exit` and hit enter. The edit program will ask you if you want to save the file and exit, or discard changes and exit. Choose Save File and Exit and press <ENTER>.

3.3.3 Chart Files

3.3.3.1 Chart files are currently generated manually from Hydrographic Office paper charts via a digitising tablet. The outlines of chart features, eg coastlines and islands, are stored as lists of latitude/longitude coordinate points, the so-called "vector format". This format was adopted as it lends itself to zooming and panning.

3.3.3.2 At the present time the following chart features and functions can be stored in the chart file:

- UTM Zone
- Coast lines, shown on the Navigation Window as brown shading
- Shallow water areas, shown in blue on the Navigation Window
- Tidal zones or reefs, shown as a green-filled area
- Channel markers, stored as 'Chart Objects'. These are shown in cyan as: 
- Wrecks. The wreck symbol is also cyan, with form: 

3.3.3.3 The default chart file directory is entitled **\CHARTS**.

3.3.4 Configuration File

3.3.4.1 It is planned that later versions of SonaView will store the current default settings in a file called SonaView.CFG. This will enable the operator to configure the program's start-up format to suit him- or herself. At the present time, however, the configuration file contains two lines of instructions. The first line defines the drive letter of the first optical disk drive. If, for instance, the computer contains just one hard drive (Drive C) then the first optical disk drive is probably allocated at the drive letter D. In this case the first line of SonaView.CFG will contain the string (upper case is important and there should be one space between each of the words in the command string)

FIRST OPTICAL DISK ID,D:

This ensures that optical disk system errors are correctly reported by the program.

The second line of the file contains the identification code for the last-opened target file. This code is described in Section 3.3.7 below. The format for this line will take the form

CURRENT TARGET FILE ID,123

In this example the currently opened target file has the code number 123.

3.3.4.2 The default directory for the configuration file is **\SONAVIEW**

3.3.5 Mission Files

3.3.5.1 When a survey is planned, a series of laptracks or runlines are set up which the survey vessel is required to traverse. The quality of the outputs of the survey are very strongly influenced by how well the vessel has been held to these runlines. For instance, if the vessel has been allowed to drift off-track at a particular point, a 'holiday', or gap in the sonar ground coverage, may have occurred.

SonaView uses a file called a *mission file* to present the vessel's planned survey route.

It is possible to store both runlines and waypoints in the mission file. Runlines and waypoints are superimposed over the chart image on the Navigation Window and either of these can be made a 'chart reference', against which the position of a cursor can be measured. Waypoints appear on the Navigation Window as a yellow triangle △ . Runlines appear as green lines, except when one is selected as a cursor referent, when it is shown in yellow.

The mission file is normally stored in the Current Mission Directory.

3.3.6 Target Type Descriptor File

Because SonaView is meant to be used for research purposes as well as operationally, there is a fair degree of flexibility in the identification of target types. For normal operational use, however, the target types are strictly defined: Type 1 = 'Test'; Type 2 = 'Object of Interest' etc. The file which carries this definition of target type is called the target type descriptor file. The file is called TARGET.DSC and it is normally located in directory **SONAVIEW**.

3.3.7 Target Output Files

3.3.7.1 Each time a target is marked during post-processing, data is written to one or more of the target output files. For Mine Warfare Route Survey (MWRS) purposes, the only significant target output file has a '.REC' file extension. (REC for sonar target RECords). To carry on the example from above, a file which arose from the analysis of data recorded in the Brisbane area may be called BRIS97.REC. When a target file is created, it is assigned a Target File Identification Number. This number is unique to that file and it is used in combination with each target's within-survey number to uniquely define the target, no other target can have that combination of Survey Target and Target File ID numbers.

The .REC target output file is the principal repository for the storage of post-processing results. This is the file which will be read by a Geographic Information System (GIS) such as ARCVIEW. All the target output files are generally stored in the Current Mission Directory. There is one other target file which is created or appended to when a target is deleted. This file carries the extension '.DEL'. If a target is deleted, its details are removed from the current .REC file and written to the .DEL file. In this way a permanent record is kept of all possible sonar target identifications. Once a target number has been assigned for a particular target file, that number will

not be re-used, even if that target is subsequently deleted. This means that, for a particular target file, there can be no ambiguity as to which target a particular number applies to.

When analysing data in 'DSTO target analysis mode', data is also written to files with '.POS' and '.CEN' extensions. These files are of significance for research purposes only, and will not be discussed further here.

3.3.7.2 Format of the Target Output File.

The detailed specification of the storage format for the Target Output File is included in Appendix 2. The file is stored as an ASCII text file with each field separated by a comma. Data were selected for inclusion in the Target Output File to enable an officer conducting a review of the survey analysis to make a judgement as to:

- The location of various targets
- The characteristics of each of the targets
- The level of confidence which should be attached to each target which has been detected and classified

Chapter Four: Initialising, Resuming and Terminating a Post-processing Session

4.1 Introduction

Once the operator has performed the preliminary steps of creating the Mission Directory (described in Section 3.2), crunching the optical disks (see Section 3.3.1), and preparing an Abstract Summary File, then it is time to initialise SonaView. If a survey mission is being analysed for the first time, then there are a few additional steps required. These are described in detail below.

4.1.1 The Start-up Sequence

Before starting SonaView, the operator should change to the Mission Directory which has been created to store the results of the survey mission. If, to continue the example of Section 3.2.2, the mission directory is **\AUS236** then the following command should be typed at the DOS prompt:

```
CD \AUS236<ENTER>
```

Then the program is started by typing

```
SONAVIEW<ENTER>
```

Sonaview will present a start-up message, and ask the operator to insert either one or two optical disks into the drives and hit <ENTER>. If the program finds two optical disks, it will interrogate them to confirm that they are both from the same survey. Assuming that this is the case, then the program works out which parts of the disks actually contain corresponding data.

Whether there is one optical disk or two, the program also reads the details of any marked SIDA contacts into memory. In the next stage of SonaView's start-up sequence, the program attempts to find an optical disk abstract which matches one of the mounted disks. If this is successful, then the abstract is loaded into memory. In the final stage of the start-up sequence, the program opens or creates default Mission and Target files. At this stage the program returns control to the operator. It should be noted that, depending on the optical disks, it can take SonaView two or three minutes to complete the full start-up sequence.

For the operator, the initialisation, resumption or termination of a post-processing session is done through the File Menu, which allows the operator to

- select or change all of the files which SonaView requires to post-process a particular mission;
- add or remove items from some of the files;
- change optical disks and

- EXIT THE PROGRAM, using <ALT>F,X similar to many Windows programs.

The file menu is accessed by typing <ALT>F.

4.2 Opening a Chart File

When SonaView is initialised, there is no Chart File loaded. This means that the program will not present a chart on the Navigation Window. When conducting a general review of survey data this may be acceptable. For more detailed analyses, however, it will normally be desired to specifically load the Chart File which applies to the area under survey. This will help the operator to visualise which part of the survey is currently under analysis and it will also show any significant chart objects or wrecks which would be expected to return sonar contacts. Chart Files are loaded via the Open Chart File Command which is accessed by typing <ALT>F,C. This brings up a dialog box which looks something like this:

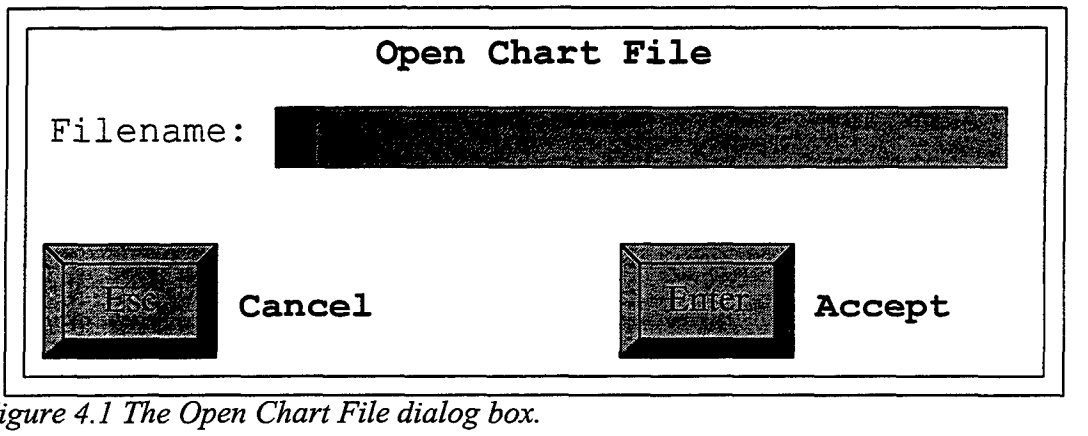

Figure 4.1 The Open Chart File dialog box.

As the filename is typed, the highlight box moves across the screen. If an incorrect key is typed, use backspace to delete the incorrect characters and then type the correct characters. If the chart is located in directory **\CHARTS** there is no need to type the path, it is sufficient to type the filename and extension. Thus, for example, if the chart file AUS235.CHT is to be loaded, the operator simply types

AUS235.CHT<ENTER>

If the chart file is located in some other directory, then the full path must be typed. For example, to load the a file of the same name which is located on drive D in a directory called **AUS235**, the operator must type

D:\AUS235\AUS235.CHT<ENTER>

If it is decided that there is no need to open a new file after all, then typing <ESC> at any time backs out of the message box and returns the program to the File Menu.

4.3 Opening a Mission File

At start-up SonaView opens a mission file named MISSION.LOG. If the program doesn't find such a file, it creates an empty one. This is intended to be a scratch file in which the operator can store temporary waypoints or runlines during a preliminary or cursory review of survey data. Once again, however, it would be normal for the operator to want to open a Mission File which applies specifically to the survey under analysis. The Open Mission File Command is accessed by typing <ALT>F,M. This brings up an input box which looks similar to Figure 4.1, except that the dialog box has the heading 'Open Mission File'. In this case if no path is specified, the Mission File is opened in the Mission Directory. If a full path is specified, then the Mission File will be stored at that location. Note however, that this does not change the Mission Directory, so Target files will still be written to the existing Mission Directory. It is probably safest to keep both the Mission and Target files in the same directory, even if this results in some duplication of the Mission files. If the specified Mission File does not exist, then SonaView creates a new file with that name.

4.4 Adding items to the Chart File or Mission File

The first time a particular survey is analysed, the operator would normally add into the Mission File the runlines and/or waypoints which were specified in the survey operations order. It may also be desired to update the Chart File by adding additional objects into it. Either of these processes are achieved through the Edit Chart/Mission File command. This command opens up a second level menu, currently called the Runline/Waypoint Sub-menu. It is selected via the keystroke sequence <ALT>F,E. This sub-menu is very much under development and, as such, is still a bit clumsy. It is possible, nevertheless, to fulfill most of the requirements for mission plan layout.

The Runline/Waypoint Sub-menu gives the operator the ability to create mission waypoints, mission runlines, chart objects and chart wrecks. The menu also enables the operator to delete individual waypoints, runlines or targets. It is planned that, in the future, it will also be possible to edit existing waypoints or runlines. For the moment the only way to edit a waypoint or runline is to delete it and start again. This menu looks something like Figure 4.2.

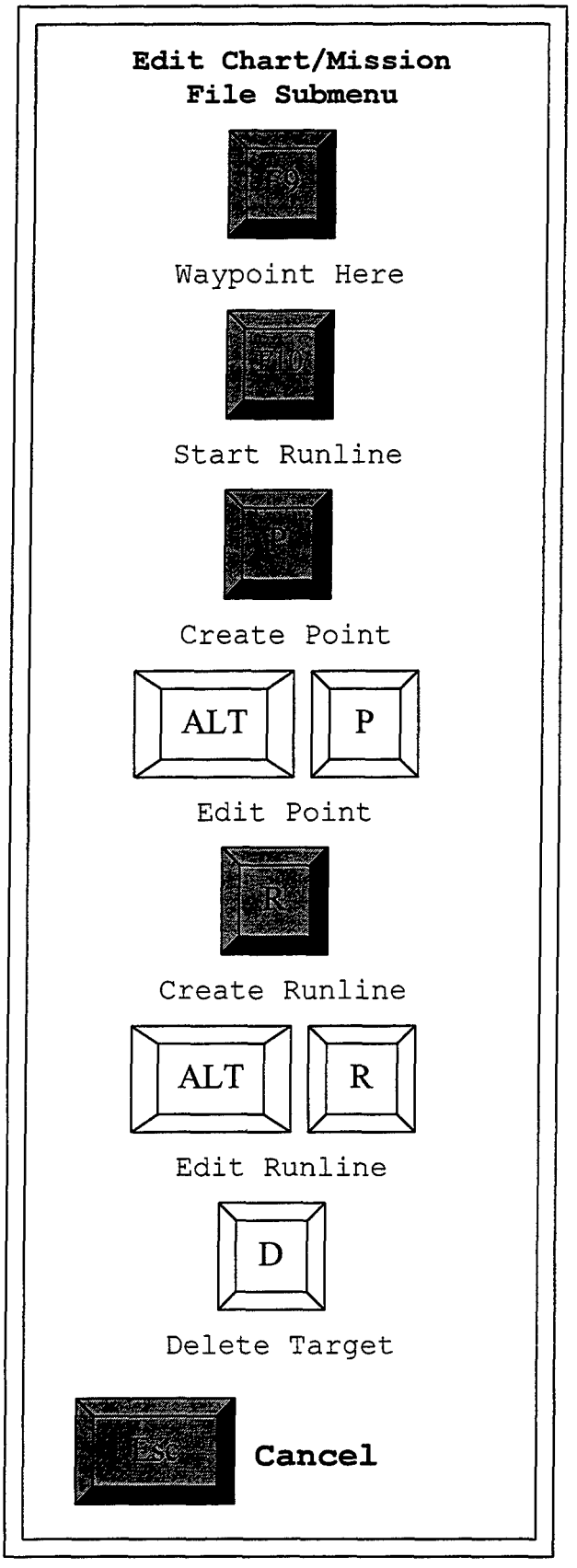

Figure 4.2 The Runline/Waypoint Sub-menu

4.4.1 Adding a Point to the Mission File or Chart File

Where a survey is to be conducted along a single laptrack, it may be desired to enter start and end-points as waypoints rather then as runlines. This is done via the Create Point command in the Runline/Waypoint Sub-Menu. The active key for this command is the 'P' key. This is not a hot key option, it can only be entered via this sub-menu. Upon pressing 'P' the following input box appears:

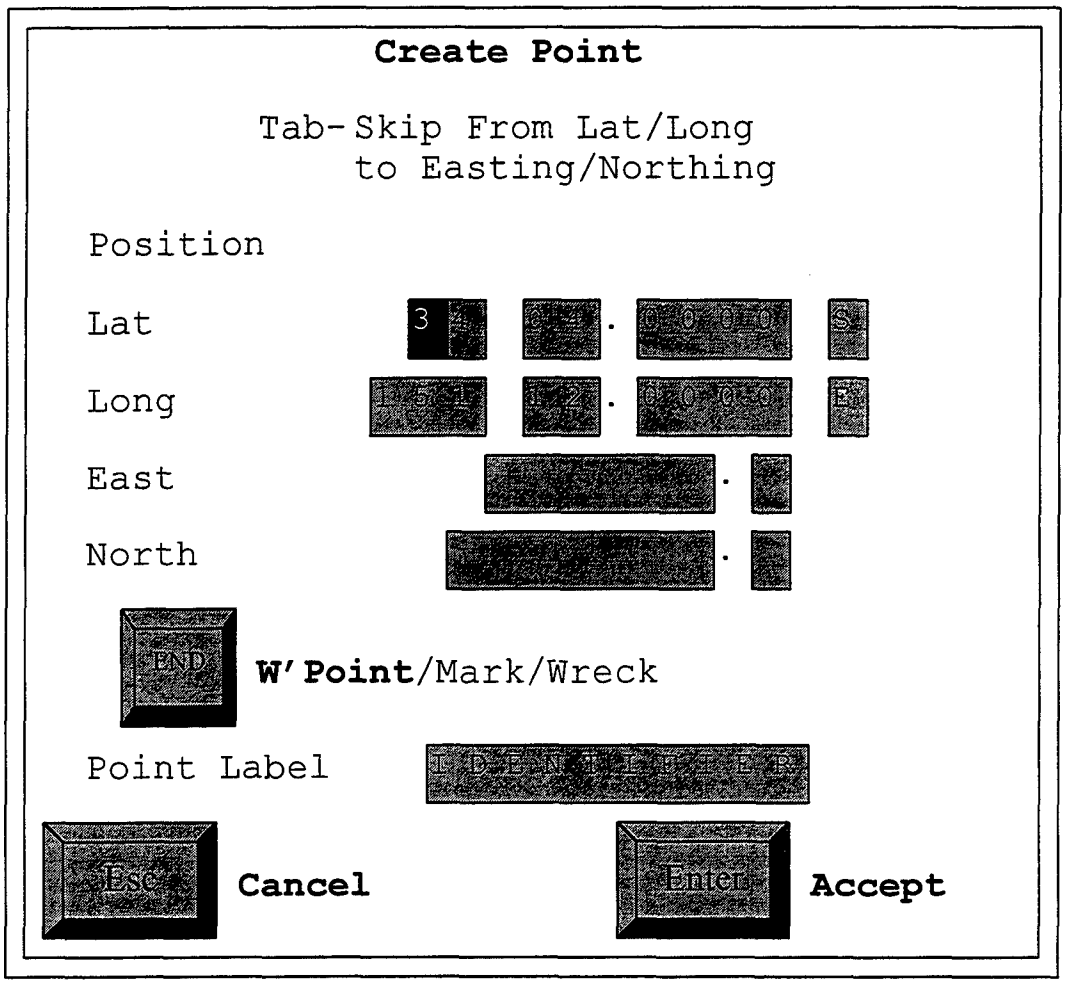

Figure 4.3 The Create Point input box

The default is for the input box to initialise with the latitude and longitude inputs active. If it is desired to change to eastings and northings, then press the <TAB> key and the Lat/Long fields will be blanked off and the first character in the East/North fields will be highlighted. One moves around these fields with the right, left, up, and down arrow keys and then over-types the characters with the desired characters. Pressing the <END> key selects a new object type, eg changes the type from Waypoint to Mark, and the new choice highlighted. In this case a 'Mark' is a shorthand equivalent of a chart object (i.e. 'mark' as in channel marker).

4.4.2 Adding Runlines to the Mission File

This process is somewhat similar to its Create Point equivalent, as is evident from Figure 4.4. The Create Runline command is activated from the Runline/Waypoint

Sub-Menu by typing the 'R' key. The greatest difference between this input box and that for creating a single point is that, in this case, there is a need to define both start and end points *for the central runline*. There is also a field which allows the operator to define how many extra runlines there are on each side of the central runline. If only a central runline is required, then this field should be set to zero. A further field allows the operator to select the runline spacing, in whole metres. There is no option to insert fractional metres (eg 74.3) in this program. In the example shown there are 5 runlines per side, giving a total of 11 lines (including the central one), and the runline spacing is 50 metres.

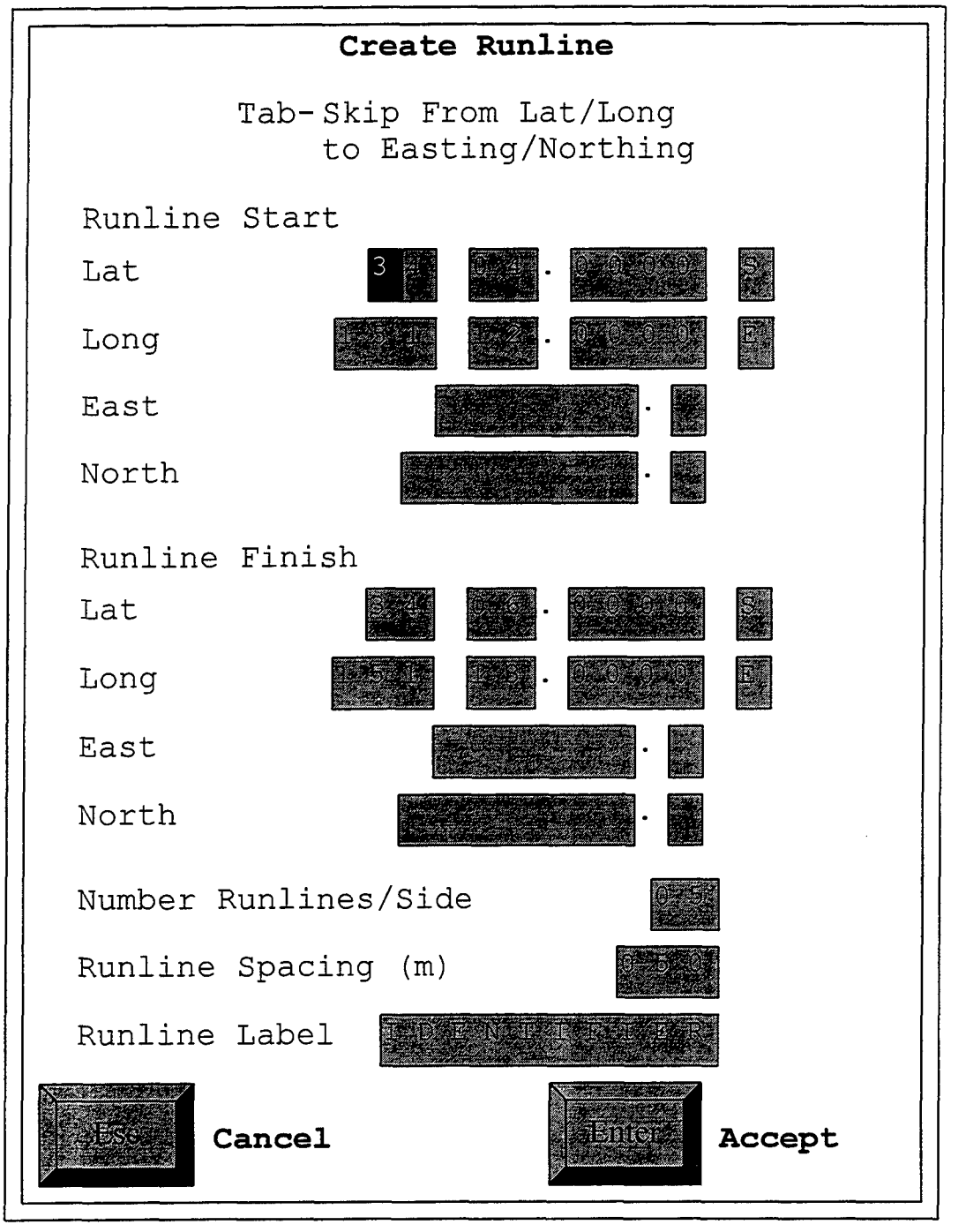

Figure 4.4 The Create Runline input box

4.4.3 Deleting an unwanted runline or point

If a mistake is made in defining the coordinates of a runline or waypoint, the incorrect item can be deleted. This is done with the Delete Runline/Target command which is found in the Runline/Waypoint Sub-Menu. In order to delete a runline or waypoint, it must be selected as a Current Cursor Referent (defined in Section 2.5). The process for making this selection is explained in Section 5.2.3. The Delete command is shown as inactive in Figure 4.2. This is because when SonaView is initialised, there is no Current Cursor Referent. If a cursor referent of types Runline, Waypoint, or Target is selected, however, this command becomes active. For example if a runline is currently selected, then this line of the menu will state 'Delete Runline' and pressing the 'D' key will cause that particular runline to be deleted. If there are other runlines remaining, then a radio button input box will be displayed to allow the operator to select a new runline as the current Cursor Referent. This is the Select New Referenced Item input box which is described in full in Section 5.2.3.

4.4.4 Editing runlines or points

Figure 4.2 shows inactive menu command keys for editing points or runlines. These commands are not yet available.

4.4.5 Other methods for creating waypoints or runlines

There are options available which allow the operator to add waypoints or runlines at any time during a post-processing session. These are explained in the following paragraphs.

4.4.5.1 Creating a waypoint at the current cursor location

There is an option, activated by pressing the <F9> key, which gives the operator the ability to create a reference waypoint at the current cursor location. The use for this may, for instance, be to mark a point along a survey line where a change of course should be made to avoid foul ground. When the key is struck, a red coloured message box opens up to provide the operator with a visual confirmation of the position of the point, and its assigned waypoint number. The <F9> key is actually a hot key - it can be pressed at any time and from any menu, except where the program is waiting for a specific keyboard input, and the position will be marked.

4.4.5.2 Creating a runline at the current cursor location

This option allows the operator to define the current cursor location as the start or end point of a single runline. Once again this is a hot key option, and is activated by pressing <F10>. Upon the first keystroke a start runline flag is generated on the Navigation Window (a green 'X') and the position and identifier for the runline is displayed on a red message box. Upon the second strike of the <F10> key, the position of the runline endpoint is displayed, and a runline is created on the Navigation Window. This is probably of limited use in the post-processing context, but it was programmed for use in a real-time navigation program which shares many routines with SonaView, so I left it in the program.

4.5 Opening an Abstract Summary File

Once the Chart and Mission Files are loaded, the operator may also wish to load an Abstract Summary File. These files are useful when a survey has extended over more than one pair of optical disks, as explained in Section 3.3.2. Once again the dialog box takes the form of Figure 4.1, except with a different heading. The Abstract Summary file should normally be located in the Mission Directory. The menu is selected by typing <ALT>F,A.

4.6 Opening Target File(s)

The next step in the initialisation sequence is to open Target File(s) for SonaView to write to. Once again this is done through the File Menu. The command is activated by typing <ALT>F,T and the dialog box takes the form of Figure 4.1, except with a different heading. The Target files should normally be located in the Mission Directory. There is one essential difference between this command and the other file commands - there is no need to type a file extension. This is because the program needs to create four target files with the same file name but different extensions. These are .REC, .DEL, .POS and .CEN files. If the operator types a file name with an extension, say JOEBLOGS.TAR, the program will strip the extension off anyway before creating the target files. If the nominated file already exists SonaView looks at the .REC file to see if it already contains target records. If it does, then the program reads the file's Target File ID Number. If the .REC file does not exist, or if it exists but is empty, then the program creates a new file and allocates a new Target File ID Number to it. In either case a message box is presented to tell the operator what the ID number is.

SonaView opens with a default target file called TARGET.REC. This should normally be changed before post-processing commences.

4.7 Swapping to the next set of optical disks in a survey

It is not necessary to exit the program in order to change to a different set of optical disks - this can be done via the Swap Optical Disks Command. After typing <ALT>F,S the computer displays a message instructing the operator to 'Exchange optical disks and hit ENTER'. At this point the old disks should be manually ejected from the drives and replaced before pressing the <ENTER> key. Depending on the disks, the exchange process can take a minute or two so this is probably a good time to make a brew. After the new disks have been interrogated by the program it will attempt to load a new abstract and then it will generate an input message box giving the operator two options to decide from what point on the new disk(s) to start replaying data. The first option is to move to a specific record number on one or the other of the disks. This is described in detail in Section 8.2. The second option is to begin replaying from a specific point in the optical disk abstract. This option is described in Section 8.3.

4.8 Terminating a Post-Processing Session

There are two methods for exiting from SonaView. Both are equally valid in that SonaView cleans up after itself upon exit. This means that all files are closed or deleted if not required and all memory is handed back to the operating system. The two exit methods are relatively traditional in that they are used in many programs. The first, and simplest method for exiting the program is to type 'Q' (for Quit). The second method follows a widely used convention which is to exit via the File menu by typing <ALT>F,X (for eXit).

Chapter Five: The Work Window

5.1 Introduction

Once all of the relevant files have been created or opened, the operator would normally switch the Parameter Window into its Work Window format. This is done by typing the key sequence <ALT>R (for Revert to Work Window). The Work Window is designed to present the operator with a continuously-updated range of useful information and some of the frequently-needed options. The operator has some flexibility in tailoring the Work Window to suit the particular requirements of a particular survey. In most cases, however, the operator will probably want to use the default Work Window, which is described in the next section. Alternative formats will be discussed below in Section 5.4.

5.2 The default Work Window

Figure 5.1 is an illustration of the window. When the program is first initialised several of the Work Window menu icons are shown as inactive. In the example, however, a runline has already been selected so all menus have become active.

5.2.1 Towfish Depth display

Starting at the top of the screen is an 'echosounder' display of the last 100 towfish depth updates. This gives the operator a useful tool for monitoring the health of the depth sensor on the Trackpoint II transponder. If the towfish depth output becomes unreliable (for instance if the survey is being conducted in 20 metres of water and the towfish depth is reported as 35 metres), then this is a good indication that the Trackpoint II updates have become unreliable. The current towfish depth is also printed as a numeric output. If the towfish depth goes off-scale for the echosounder display, then the numeric depth output changes from white characters on a blue background to a bright yellow background with black numerals.

5.2.2 Referent Type field

When the program is initialised, this is the only active menu icon on this window. By hitting the <END> key the operator brings up a radio button input box which lists all possible cursor referent types. This is actually a hot key, so its function can be invoked from any point in the program. The full complement of potential referents is:

- None
- Chart Object
- Wreck
- Waypoint
- Runline
- Target
- SIDA Contact

If a particular referent type is unavailable, then it is not offered for selection. Thus if the chart file contains no wrecks, no waypoints have been created and no targets have been marked, then only 'none', 'chart objects', 'runlines' and 'SIDA contacts' will be presented in the input box. If 'none' is selected, then most of the Work Window fields will remain blank. Let's assume for the following descriptions, though, that the referent type is set to runline. In this case the Referent Type field will contain the word 'RunLine'.

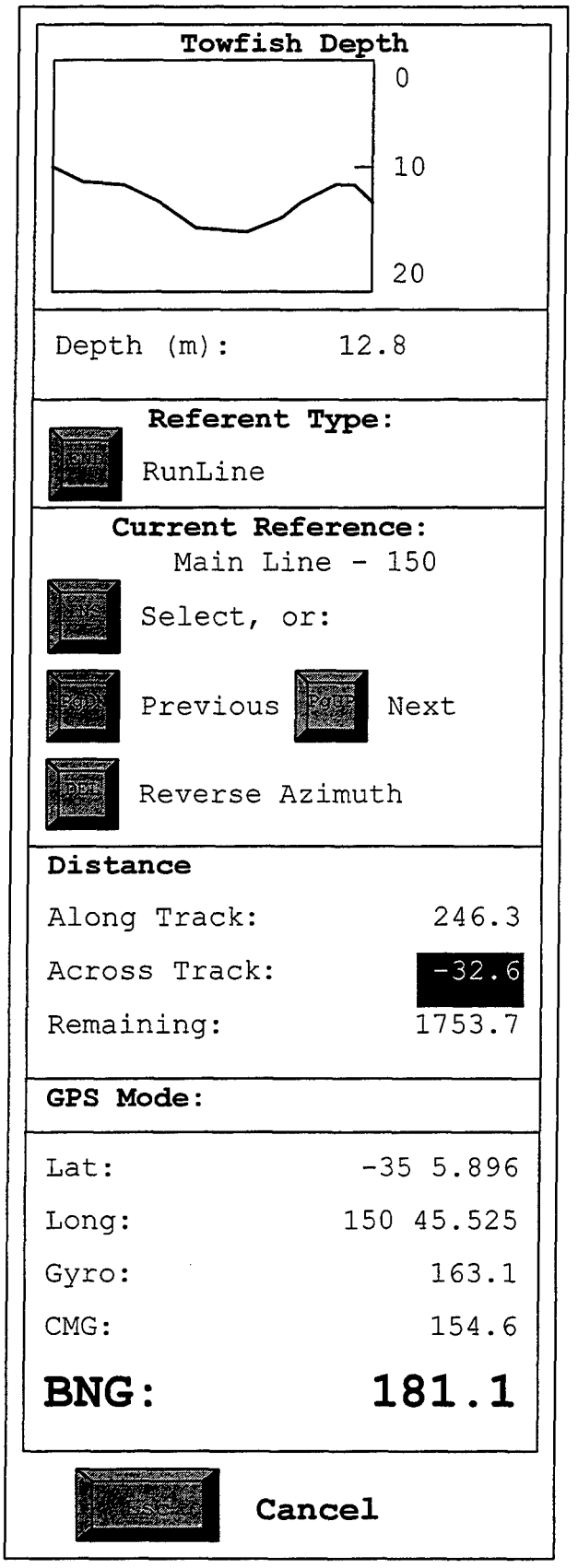

Figure 5.1 An example of the default Work Window

5.2.3 The Current Reference Item Field

Having selected a referent type, it is now necessary to select which particular item is to the current cursor referent. There are two ways to make this selection. If there are only a few items to chose from, then it may be most convenient to simply step through them using the <PAGE UP> and <PAGE DOWN> keys. As each new item is selected the Current Reference Item field is updated and the Operations Plot is re-drawn. To continue the example, in Figure 5.1 the currently selected reference item is a runline with the descriptor 'Main Line - 150'. In this case the selected line is displaced 150 metres from the central runline, which is entitled 'Main Line'.

The second method for selecting a new item is via the Select New Referenced Item input box, which is brought up by pressing the hot key <INSERT>. This radio button input box would normally be used if there are a large number of potential reference items, such as may apply with Targets or SIDA Contacts. Each radio button is associated with a single item and is presented with a descriptive label. For instance to select the runline shown in Figure 5.1, the operator would hit <ENTER> after placing the radio button as follows:

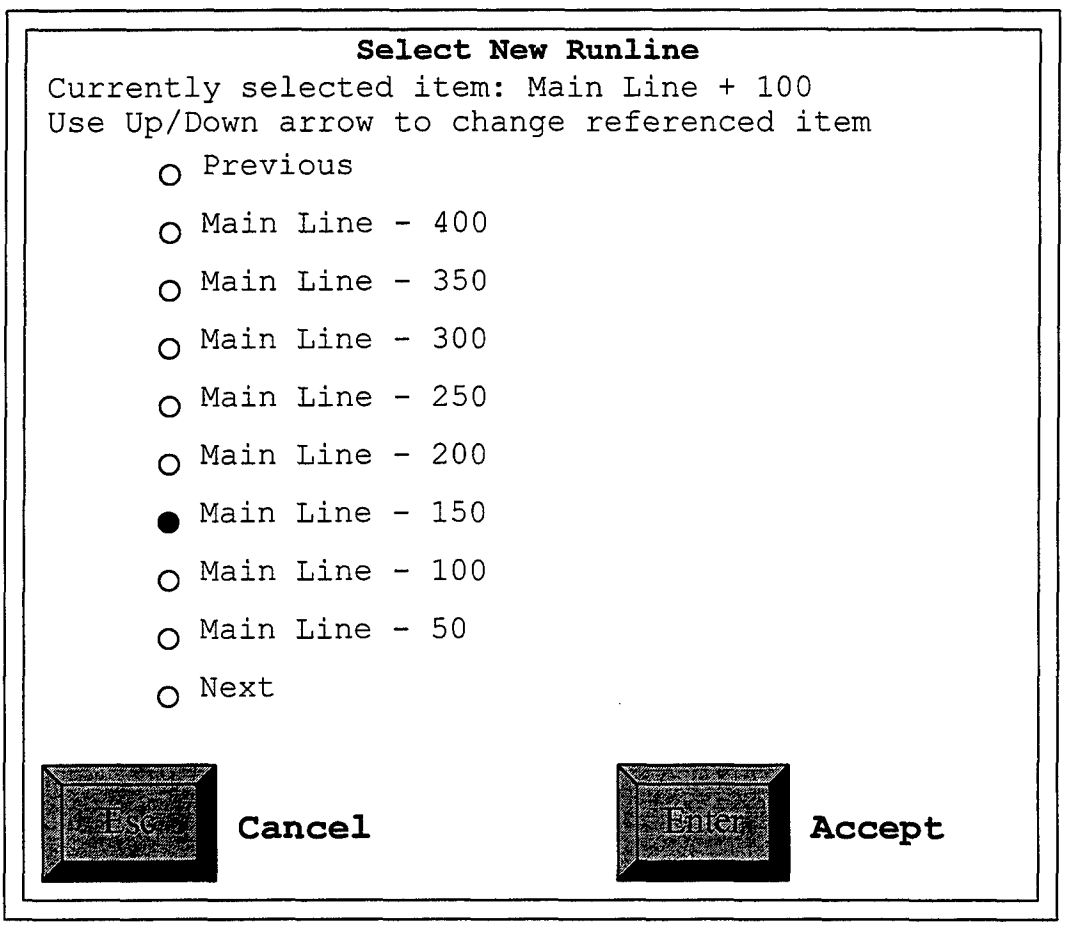

Figure 5.2 An example of the Select New Referenced Item input box

This is a much quicker method of moving between non-adjacent reference items, because it is not necessary for the computer to re-draw the chart between each keystroke, as is the case with the first selection method.

The currently selected reference item is highlighted on the Navigation Window. For all items except runlines the item is surrounded by a yellow circle. The form of the highlight for a selected runline is described in the next Section.

5.2.3.1 The Reverse Azimuth Icon

Where the cursor referent is of type runline, there are two possible directions against which the referent-relative measurements can be made, that is, either end of the runline can be regarded as its start. When a runline is selected, its symbol on the Navigation Window changes from a simple green line to a yellow arrow as follows:

The arrow indicates the normal direction of travel along the runline. If the survey has been conducted the opposite direction along the runline then the azimuth can be reversed by pressing the <DELETE> key. The runline will be re-drawn with the arrow pointing the opposite direction.

5.2.4 The Distance Field

This field is active whenever a current cursor referent is defined.

The first two elements of the field, headed 'Along Track' and 'Across Track' are only active if the cursor referent is of type runline. The along track distance is the distance, along the direction of the runline, from the start of the runline to the current cursor location. The across track distance is the perpendicular distance from the runline to the current cursor location. If the cursor is to the port side of the line, then the distance is presented on a red background and is negative. If the cursor is on the starboard side of the line, it is presented on a green background and is positive. The distances are expressed in metres.

The third element of the field, headed 'Remaining', is active for all referent types. It is the distance, in metres, from the current cursor position to the cursor referent.

5.2.5 The GPS Mode Field

This field is used by SonaView's real-time navigation counterpart program. In that program it presents the current status of the GPS navigation system (differential, normal, stalled). I have left the field there to make allowance for possible future program developments.

5.2.6 The Cursor Data field

The next active field of the default Work Window is used to present a range of useful information:

- Latitude. A negative latitude applies to the southern hemisphere
- Longitude. A negative longitude applies to the western hemisphere

- Ship's Gyro in degrees
- Ship's Course Made Good in degrees

In each case data which are presented apply to the sonar record which underlies the cursor. This field thus gives additional information to what is shown in the Cursor Data Field on the Sonar Status Window (see Section 2.1.3.4).

5.2.7 Bearing to Referent Field

The final field of the default Work Window presents the bearing, in degrees, from the cursor to the current referent. In the case of a runline this is the bearing to its end (the arrow head). The positioning and large size of this field was designed for the real-time navigation program referred to elsewhere and has been maintained in the same form to maintain compatibility with that program.

5.3 Changing the depth scale on the towfish depth display

The default depth scale in the Towfish Depth Display field is 20 metres full-scale. If the route surveillance system has been operated in depths which differ significantly from 20 metres, it may be desirable to change the full-scale range. This is done through the Towfish Depth Range radio button input box in Control Screen menu. The input box is opened via the key sequence <ALT>C,D and the following full-scale options are available for selection:

- 10 metres
- 20 metres
- 50 metres
- 100 metres
- 200 metres
- 400 metres

This input box is only active if the Work Window is in its default format.

5.4 Alternative Work Window formats

5.4.1 Available Alternatives

There are currently three other Work Window formats available for selection. The alternative formats are selected via the Control Screen menu. Including the default format, the alternatives which are available are:

- Chart-relative statistics with keyhelp
- Chart-relative statistics and depth (default)
- Navigation position at cursor
- 'Hot key' assignments

5.4.2 Chart-relative statistics with keyhelp

The first alternative Work Window replaces the Towfish Depth fields with some keyhelp icons. These can help an inexperienced operator 'navigate' around the Navigation Window. They include keyhelp icons for panning and zooming the

Operations Plot, redrawing the screen and re-centring the Operations Plot onto the cursor. These functions are described in detail in Chapter Six. This form of the Work Window is illustrated in Figure 5.3

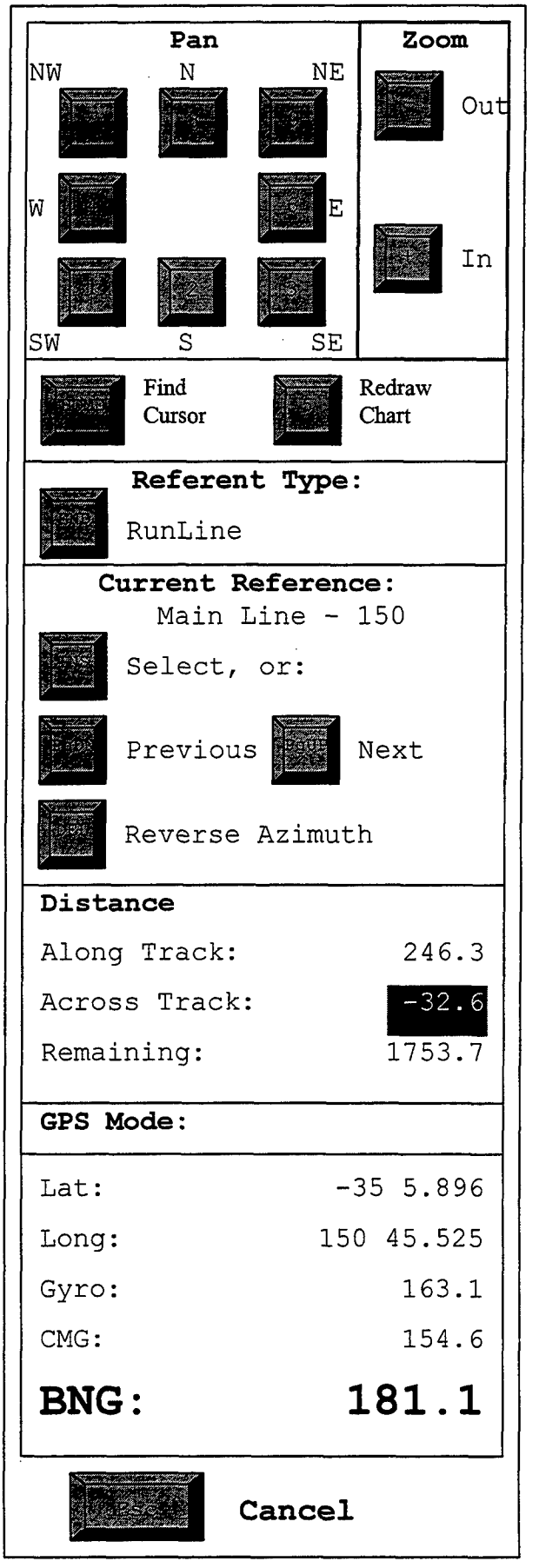

Figure 5.3 An alternative Work Window Format

5.4.3 Navigation Position at Cursor Format

Probably the most useful of the alternative Work Window formats has the cursor data field expanded somewhat to include:

- Cursor Easting (copied from the Sonar Status Window on the Sonar Screen)
- Cursor Northing (ditto)
- Towfish Easting
- Towfish Northing
- Vessel Easting
- Vessel Northing
- Vessel Gyro
- Vessel CMG

These fields are at times useful when the operator is trying to decide what has happened when navigation information appears to have gone haywire.

5.4.4 'Hot key' help option

The third alternative Work Window format simply presents icons for some of the most useful hot keys.

5.4.5 Selecting a new Work Window Format

The Select Work Window Format radio button input box is located in the Control Screen menu. It is activated via the keystroke sequence <ALT>C,W. This input box offers the operator the option of selecting any one of the formats described in the preceding Sections. A final option which is shown in this input box, 'Current Settings', has not yet been programmed. If the operator attempts to select this option, a polite message will state that a non-functional menu option has been selected, and the program will return to the current Work Window format.

Chapter Six: Tailoring the Navigation Window

6.1 Introduction

Chapter Five described options which allow the operator to set up the Work Window to best suit the requirements of a particular survey under analysis. There are also a number of options available with which the operator can optimise or adjust the Operations Plot which is presented on the Navigation Window. Several of options are 'Hot Key' controlled, and as such are available to the operator at all times. Other options can only be accessed via the Control Screen Menu which is activated via the keystroke combination <ALT>C.

6.2 Zooming the Navigation Window

In Section 2.1.4 it was explained that the navigation window presents a geographical representation, or Operations Plot, of a survey. In the default configuration, the Navigation Window displays a 1000 metre x 1000 metre square region. There are occasions when it is desirable to 'Zoom In' on a part of the plot so that the operator can inspect it in more detail. An example would be if there are a number of targets or contacts in a small area. At other times it may be desirable to present a general view of a survey area. In this case the operator may wish to 'Zoom out' to show a larger, but less detailed, plotted area.

The Operations Plot can be zoomed so that the Navigation Window covers square regions with the following dimensions on the side (i.e. the displayed size in the directions of UTM Northings and UTM Eastings:

- 50 metres (fully Zoomed In)
- 100 metres
- 250 metres
- 500 metres
- 1000 metres (default size)
- 2000 metres
- 4000 metres
- 8000 metres
- 16000 metres
- 40000 metres (fully Zoomed Out)

To zoom in the operator should press the '+' key. Each time the key is pressed, SonaView zooms in to the next scale. To zoom out, the operator must press the '–' key. Again the program zooms to the next level, but in the other direction. Note that the plot remains centred on the same point, which corresponds with the centre of the Navigation Window. Thus, when zooming in, if the place of interest is not centred on the plot it may disappear off the screen. The methods which are available for panning the point of interest back onto the screen are discussed in the following sections.

Figure 6.1 illustrates a plot of a hypothetical harbour which is presented at the default scale and which has been zoomed in twice (i.e. the '+' key has been struck twice). Note that, while the SIDA contact and the SonaView target maintain their correct relative positions, their symbols don't zoom. Note also that, after zooming in, SIDA contacts 74 and 75 and the chart object are no longer on the screen.

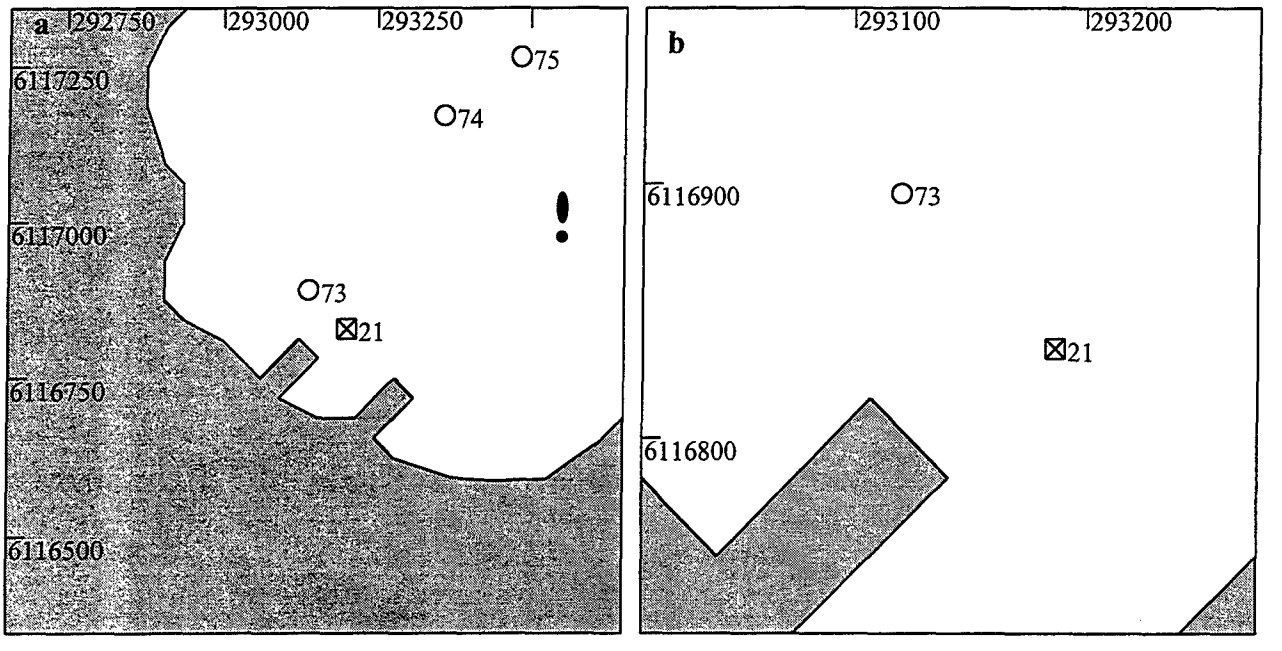

Figure 6.1 Illustrating the Navigation Window presented at (a) the default zoom scale and (b) zoomed in twice.

6.3 Panning the Navigation Window

Panning is the process whereby the *centre* of the Operations Plot is shifted in a prescribed direction. Figure 6.3 illustrates the result of panning the Navigation Window in a North-East direction. When SonaView performs a panning operation, it shifts the centre of the window in the required direction by 25% of the window span. For instance, if the window spans 1000 metres each way, then the centre of the window will be panned 250 metres in the prescribed direction. Incidentally, referring back to Section 6.2, it is worth noting that SIDA contacts 74 and 75 have now been brought closer to the centre of the Navigation Window, so that they will not disappear off the screen so readily if the window is zoomed in.

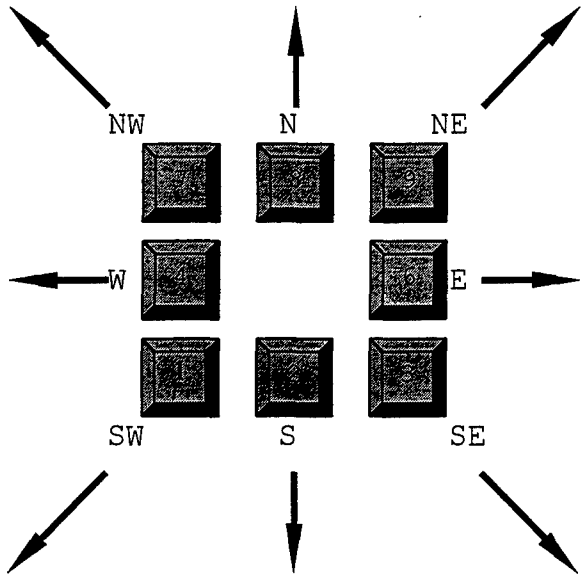

Figure 6.2 Illustrating the directions in which the centre of the Navigation Window is panned for each of the Pan Control Hot Keys.

The available pan directions, and associated hot-keys are shown in Figure 6.2. These key allocations were made so that, when the operator uses the keypad at the right side of a standard keyboard, each key position gives an indication of the direction in which the pan will take place.

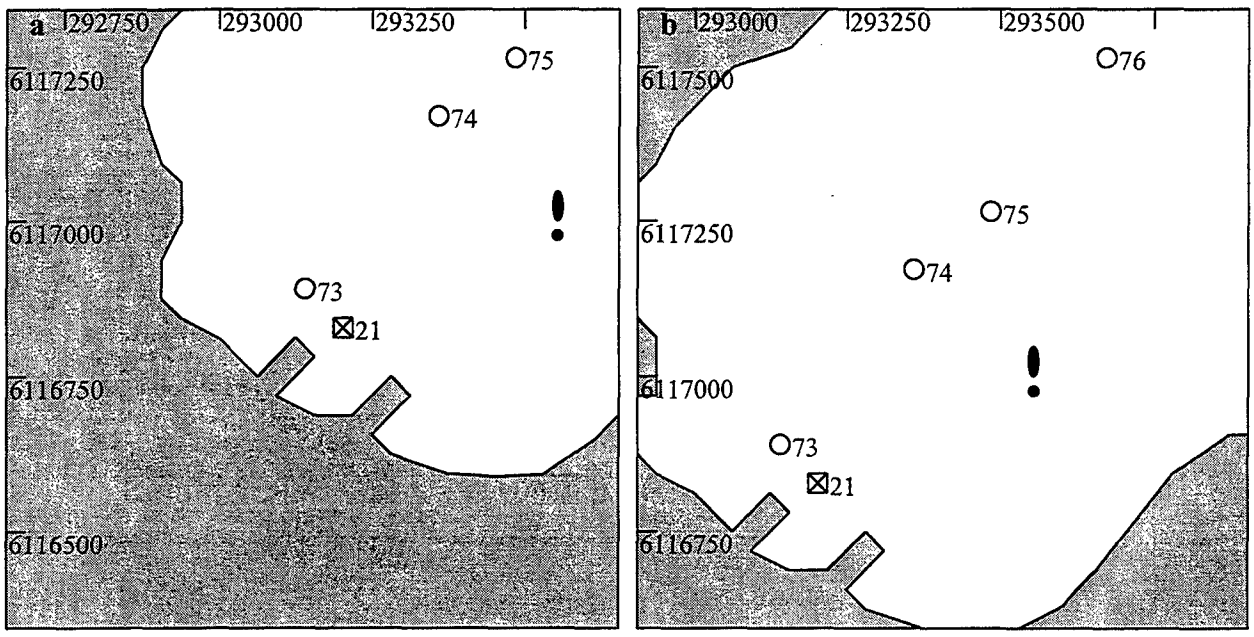

Figure 6.3 Illustrating the process of panning the Navigation Window. Note that the pan direction is the direction in which the centre of the plot moves. To get from (a) to (b), the operator has panned the plot once in the North-East direction.

6.4 Keeping the Cursor on the Navigation Window

6.4.1 Introduction

As the cursor is moved around the Sonar Display Window, it also moves to the corresponding, geographical position on the Operations Plot. If this position is outside the current bounds of the Navigation Window, then the cursor can not be displayed on that window. There are four ways to bring the cursor back into the Navigation Window:

- zooming out
- panning
- re-centring on cursor
- auto-centring on cursor

6.4.2 Zooming Out

The first method for re-locating the cursor onto the Navigation Window is to zoom the window out (pressing the '–' key) so that it covers a larger proportion of the Operations Plot. This method has the disadvantage that the resolution of the navigation display is reduced.

6.4.3 Panning

The second method is to manually pan the screen to bring the cursor back into the Navigation Window. This method works well if the operator knows in what direction the screen needs to be panned. For instance if the vessel is following a laptrack, then the cursor will lie along the line of the track.

There are other instances where this method will not work, such as when the recording has been paused and then resumed in a completely different location. In theory it is still possible to work out in which direction to pan the Navigation Window. The position at the current cursor location can be read directly off the Sonar Status Window and the operator can calculate which way the Navigation Window needs to be panned to bring the cursor back on-screen. In practice this is a clumsy and time consuming method. It is better to use either the 'Re-centre On Cursor' option described in the next section or the 'Auto-Centre' option described in Section 6.4.5.

6.4.4 Re-centring onto the cursor

This is a very simple function which can be accessed via the hot-key <HOME>. When this key is pressed the Navigation Window is re-drawn using the current position of the cursor as its centre point.

6.4.5 Auto-centring onto the cursor

SonaView has an option, which is accessed via the Control Screen menu, to auto-centre the cursor. This option can be toggled on or off by typing the key sequence <ALT>C,A.

If Auto-Centring is enabled, whenever the cursor shifts out of the bounds of the Navigation Window, the window is automatically re-drawn using the current cursor position as its centre point. The default condition is for Auto-Centring to be enabled.

If Auto-Centring is disabled, then the Navigation Window will not be re-centred if the cursor moves off-screen. It is sometimes necessary to disable Auto-Centring when the operator conducts a review of the Operations Plot of a survey. Then the Navigation Window can be panned and zoomed around the plot without having to worry about where the cursor position lies.

6.5 Re-drawing the Navigation Window

In order to prevent the Navigation Window becoming too cluttered, the vessel and towfish snail-trails only display about 20 minutes worth of navigation updates. After this time, as new updates are painted, the oldest updates are erased. Occasionally this erasure process also deletes other features in the Operations Plot (for example part of a runline or part of a chart object). If this occurs, then pressing the '5' key in the centre of the keypad will cause the Navigation Window to be re-drawn.

6.6 Re-setting the snail-trails

If a survey has involved the vessel turning back on its own track, or making multiple passes by a point at different headings, then the vessel and towfish snail-trails can become so 'intertwined' that it is difficult to tell which snail-trail belongs to which pass. The Reset Snail-trail option in the Control Screen menu lets the operator clear the snail-trails. They will then begin to re-paint from the current vessel and towfish locations. This option is activated via the keystroke sequence <ALT>C,R.

6.7 Navigation Window formats

6.7.1 Selecting the Navigation Window format

The operator has considerable freedom in selecting what information is displayed on the Navigation Window. The selection is made with the Select Navigation Window Format radio button input box, which is accessed from the Control Screen Menu via the keystroke sequence <ALT>C,N.

This input box looks like Figure 6.4.

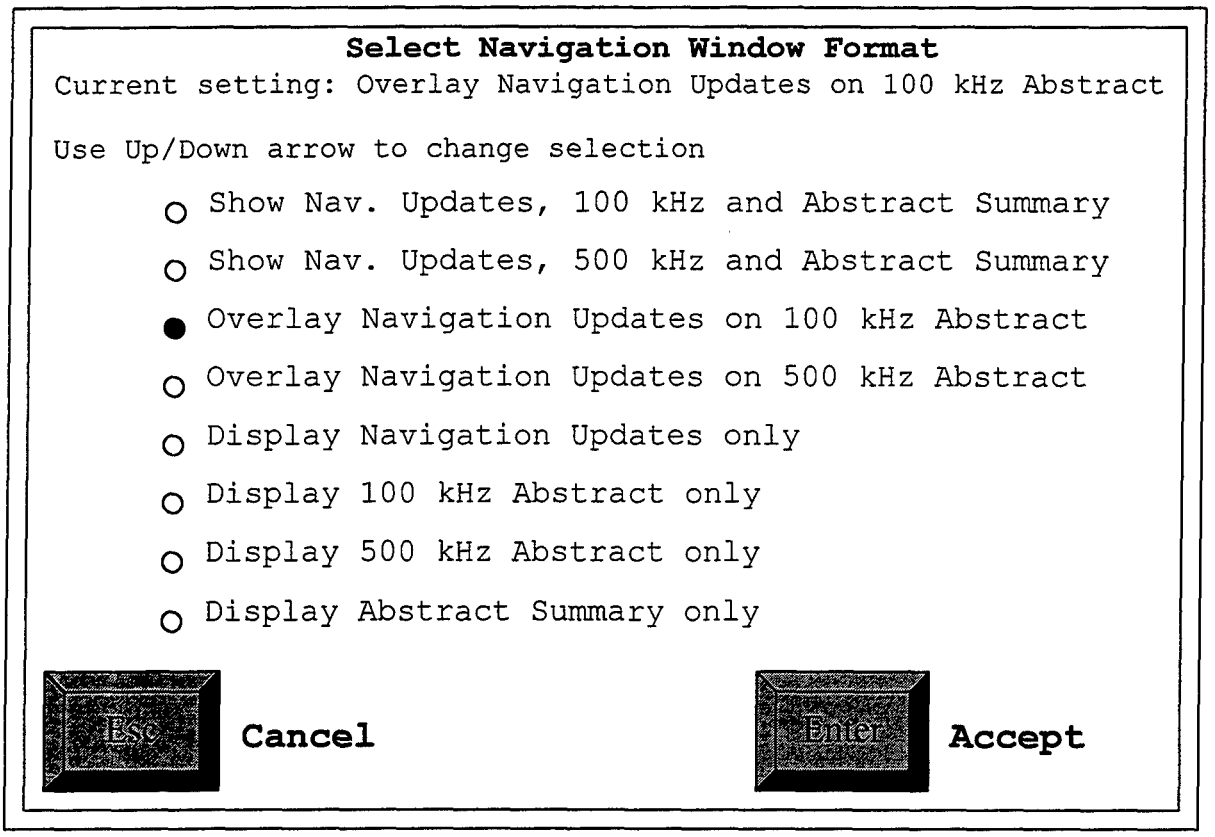

Figure 6.4 The Select Navigation Window Format radio button input box

If the operator attempts to select an option for which all of the requested items are not available, then the program selects the closest match. For example, if the operator attempts to select the first option, in which navigation updates are overlaid over both 100 kHz current-disk and summary abstracts, but no summary abstract is available, then the program will default to option 3 (as shown). If no summary abstract is available then options 1 and 2 will be shown with cyan text.

6.7.2 Some uses for the various formats

6.7.2.1 Show Navigation updates, 100 kHz or 500 kHz disk abstract and abstract summary

This format is useful when analysing a large survey involving several optical disks. The operator can see whether the survey area has been completely covered and where the current disk fits into the overall survey. Because the sonar swathe is displayed, the operator can see at a glance whether marked contacts or targets have been detected at marginal sonar range, or in the optimal, mid-range position. While this format provides the operator with maximum information, it has the disadvantage that the Navigation Window takes longer to re-draw when panned or zoomed.

6.7.2.2 Overlay Navigation updates on 100 kHz or 500 kHz abstract

This format is slightly simpler than the previous one, in that it does not present the overall summary abstracts of the mission. Consequently the Navigation Window re-draws more quickly. This format is probably the ideal compromise format for general use.

6.7.2.3 Display Navigation updates only
In this format no sonar swathe information is presented on the Navigation Window. This is the best format for visualising the distribution and characteristics of the marked targets. It is also the format which should be used if it wished to produce a print-out (see Section 6.8) illustrating the target distribution. Under these conditions it may also be useful to turn off the Target/Contact numbers, as described in Section 9.4.2.

6.7.2.4 Display 100 kHz or 500 kHz abstract only
This format is mainly intended to give an uncluttered indication of the ground coverage of a particular disk. Targets and Contacts are still displayed, but the vessel and towfish snail-trails are not.

6.7.2.5 Display abstract summary only
This is the multi-disk equivalent to the preceding format. Once again it provides a less cluttered view of the ground coverage. Either of these formats should be used if it is required to produce a hard-copy print-out showing the ground covered by the survey.

6.8 Printing the Navigation Window
SonaView has an option which allows a copy of the Navigation Window to be printed on a Hewlett-Packard™ laser printer. The printer must be connected to the first parallel port (LPT1). The print-out is initiated via the hot-key combination <CTRL><PRINT SCREEN>. Alternatively, the Control Screen menu presents an icon to show the operator the correct keystroke combination.

Note that this is essentially a monochrome (black on white) representation of the Navigation Window. The resolution of the print-out is exactly that of the screen display.

Chapter Seven: Tailoring the Sonar Screen

7.1 Introduction

There are two critical factors which determine the quality of output derived from post-processed sonar surveys. The first factor is the reliability with which the sonar operator is able to detect and classify sonar contacts. The second factor, which is discussed below in Chapter Nine and Section 10.3, is the precision and accuracy with which the positions of sonar contacts can be estimated. Considerable effort has been expended in providing SonaView with options to allow the operator to tailor the sonar display for optimal detection and classification performance. Many of these options are accessed via the Sonar Display Options Menu. Each option in this menu has its own radio button input box.

With one exception, hot keys are also available to activate or alter these options. The hot keys associated with the tailoring of the sonar screen are set up in a special way in that, unless the Sonar Display Options Menu is first activated (via <ALT>S), they do not cause input boxes to appear, rather they simply toggle to the next available condition. This was done because experienced operators generally know what the available options are and it is quicker for them to remain in the Work Window and simply toggle through the conditions until they arrive at the one they want. In the following section the second character in the option selection key sequence is the equivalent hot key, e.g. <F1> toggles the displayed sonar frequency.

7.2 The Sonar Display Options Menu

7.2.1 The Displayed Frequency input box (<ALT>S,<F1>)

This radio button input box is only activated if both 100 kHz and 500 kHz data are available. In this case the operator has a choice of three options:

- 100 kHz (default)
- 500 kHz
- Merged display

The currently selected frequency is shown at the bottom of the Sonar Status Window.

7.2.2 The Displayed Channels input box (<ALT>S,<F2>)

The SIDA system records data as three sets or 'channels' of 1024 pixel samples. These are port side slant range corrected data, starboard side slant range corrected data, and water column data. There are several potential combinations for displaying these data. It should be noted that the effective horizontal screen resolution of the data is determined by the number of channels which are displayed at one time. Thus if only one channel is displayed (say the port side slant range corrected), SonaView can present the data at its full sampled resolution. If three channels are displayed, then the

resolution is one third of the full sampled data. Note, however, that even this is better than the standard SIDA display, which uses a 6:1 pixel resolution reduction.

The optional display configurations which are available are:

- Port Side Slant Range Corrected only (full resolution)
- Starboard Side Slant Range Corrected only (full resolution)
- Port and Starboard Slant Range Corrected (default, half resolution)
- Water Column data only (full resolution)
- Port and Starboard Slant Range Corrected plus Water Column (as per SIDA, one third resolution)

It should also be noted that changing the number of columns on the display also changes the aspect ratio of ensonified objects. As mentioned above, with the default configuration of both Port and Starboard side channels, and assuming typical operating conditions of 100 metre range scale setting and vessel tow speed of 4.5 knots, the displayed across-screen swathe of the sonar is 200 metres and the displayed, along-track sonar segment is approximately 300 metres.

Whenever the cursor is overlying slant range corrected data, one of the fields in the Cursor Data Area of the Sonar Status Window displays the 'Offset' of the cursor from the mid-line. This is the horizontal distance, measured across an assumed flat sea bed, from directly below the towfish track to the position of the cursor. When the cursor is placed over water column data this field changes to 'Depth'. This is representative of the fact that the water column data is not sampled in terms of distance over the bottom, but rather is gathered in equal increments of straight-line distance to the towfish. The difference between the 'Offset' and 'Depth' measures is illustrated in Figure 7.1. In Figure 7.1(a) each successive data pixel represents increasing range across the sea bed. In Figure 7.1(b) successive data pixels represent progressively increasing radial distance from the towfish. Thus the water column channels can be used to measure the depth below the surface that the towfish is flying or, as illustrated in the figure, the distance below the fish that the sea bed interface occurs.

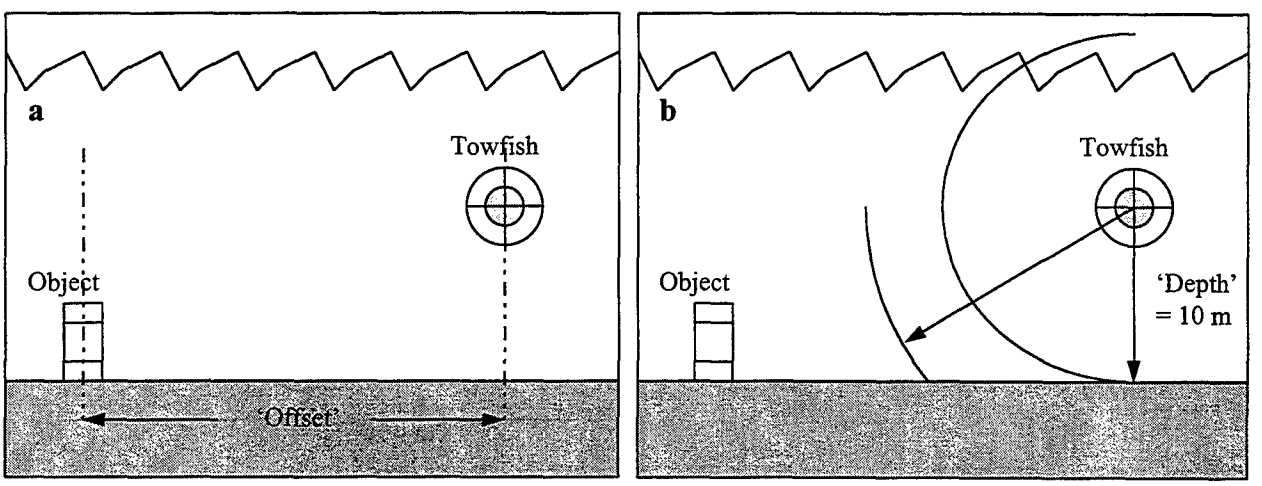

Figure 7.1 Illustrating the difference between Slant Range 'Offset' and Water Column 'Depth'

7.2.3 The Colour Scheme input box (<ALT>S,C)

There are currently four colour schemes available for the presentation of sonar data. In each scheme there are 256 grey scale levels. This is a much higher number of greyscales than is used by the SIDA (16), and it provides much better contrast resolution of background textures, particularly in the central region where the sonar generally has some trouble tuning the first bottom returns. I am not aware of any evidence to indicate that any particular colour scheme confers an advantage to the operator, except in so far as one scheme may be more comfortable to his or her eye.

The available colour schemes are:

- Monochrome (Strong signals in white)
- Inverse Monochrome (Strong signals in black)
- Awful 1 (the name says it all)
- Default colour (default, similar to SIDA)

7.2.4 The Noise Filter input box (<ALT>S,F)

It can be very difficult to review sonar images which have spurious noise superimposed on them. SonaView has two filters available which can be used to reduce unwanted noise in the sonar images. The first (default) filter is a streak filter which was specifically designed to remove interference streaks which arise from echo sounders and the ultra-short baseline acoustic tracking system. If the program detects a very strong signal which is confined to a single sonar ping, then it removes it. The second filter looks for and removes isolated, high-amplitude sonar pixels. Finally, the filters can be turned off if desired.

7.2.5 The Look-up Table input box - SonaView's 'Contrast Control' (<ALT>S,L)

The SIDA unit digitises the sonar output signal across the range 0-255. Grey-levels or colour levels on the screen are also assigned a number from 0 to 255. It is normal to present the sonar data on the screen with each sonar signal level corresponding to its own grey scale level, i.e. with the 255 grey scale levels corresponding to the 255 signal levels. There are times, however, when the sonar signal is always faint or always strong, so that image has little contrast and details are hard to see. The Look-up Table input box allows the operator to shift the colour levels to increase the contrast. For instance, if only very strong returns are appearing on the screen, the operator may like to arrange the display so that the top 128 signal levels are mapped onto the full 255 grey scales of the display. In this case all sonar pixels with signal levels less than 128 will be displayed as the lowest grey scale level. Faint bottom texture will thus be suppressed and strong contacts will stand out. This mapping is controlled via a *look-up table.*

The available look-up table options are:

- 0-255 (default - full range)
- 0-191 (emphasise faint features)
- 0-127 (emphasise fainter features)

- 0-63 (emphasise very faint features)
- 64-255 (emphasise strong features)
- 64-191 (emphasise mid-range features)
- 64-127 (emphasise low mid-range features)
- 128-255 (emphasise stronger features)

The usefulness or otherwise of this is a feature which is very much up to the operator's own taste.

7.2.6 The Merge Options input box (<ALT>S,M)

Occasionally one or the other frequency units of a SIDA system has problems and the navigation data is lost. This results in an optical disk which is very difficult to merge with its other frequency counterpart. Normally under these circumstances it is best to analyse the disks separately, but if it is particularly important to try to merge the disks then this option can be tried. This is something of a last-resort step as SonaView is trying to create a link between the two frequencies with very limited information to work with. Occasionally the consequence is that the program goes into what appears to be an infinite loop while it tries to create the link. If this takes too long, then the reset button will terminate the program.

Because this is not a 'normal' function, the operate is given a bright red warning message and given the opportunity to back out. There is also no hot key associated with this menu.

7.2.7 The Pause Scroll input box (<ALT>S,P)

This is a two-state toggle. In the first state the sonar display is allowed to scroll in its normal 'waterfall' format (Scroll mode). If Pause mode is selected, the waterfall stops scrolling and the operator can peruse the screen at leisure.

7.2.8 The Review Model input box (<ALT>S,R)

This is also a two-state toggle. In the default state, every recorded sonar record is read and presented on the waterfall display, one line per record. In Review Mode, only every fifth sonar record is read for display. This can be useful if the operator wants to do a quick review of the survey to get a feel for what the conditions are like. The principal benefit of this mode, of course, is that the disks are replayed in much shorter time - just on an hour for full disks.

7.2.9 Saving the Sonar Display Window to Disk

From time to time it is desirable to store a sonar image to the computer's hard disk. This would be the case, for instance, if one wanted to incorporate a sample image into a document. This version of SonaView has a facility for saving the current Sonar Display Window to disk. The saved file is not in any of the accepted image formats, however a separate program is available for converting the saved image file into a Windows ™ bitmap file.

7.2.9.1 The Save Sonar Display Window to Disk input box (<ALT>S,S)
This input box is very similar to Figure 4.1, but with the heading 'Save Image to File:'. The file can be given any name, but by way of example let's say that the name 'MINES.PIC' has been selected and typed into the input box. Upon hitting <ENTER> the computer will appear to pause for a few seconds. During this time the image data is being re-read off the sonar screen and written to disk.

7.2.9.2 Converting a SonaView Image file to bitmap format
To convert a SonaView image file to bitmap format, it is necessary to run the program 'MKBITMAP'. The steps are as follows:

- Exit from SonaView <ALT>F,X
- Type MKBITMAP<ENTER>
- The following line will appear: Enter input file →
- Type the name of the SonaView image file: MINES.PIC<ENTER>
- The next line is: Enter output (BMP) file →
- Type a new filename with .BMP extension: MINES.BMP<ENTER>
- The next line asks: Invert grey scales <y/ret>
- Generally you will simply type <ENTER> here
- The next line asks: Enter width of screen in pixels →
- The answer is 1024<ENTER>
- The program will now display that it has found an image height of 1021 lines.
- The last question is:
  Perform global histogram equalisation <y/ret>
- Generally it is best to type <ENTER>

At this point the computer will go away and think for a while and, having created the bitmap file, it will return to the DOS prompt. After checking that the bitmap image is satisfactory the raw SonaView image file can be deleted by typing:

DEL MINES.PIC<ENTER>

7.3 Zoom Options

It was mentioned in Section 2.1.3.5 that the Sonar Status Window contains a Zoom Window which allows parts of the sonar image to be copied or zoomed for further perusal. To zoom in on part of the sonar image, simply place the cursor at the centre of the point of interest and press any of the following zoom hot keys:

- <F5> performs a straight copy (zoom factor 1)
- <F6> performs a 2 x zoom.
- <F7> performs a 4 x zoom.
- <F8> performs an 8 x zoom.
- <Shift><F5> performs a 1:1 copy, but filters the data before displaying it.
- <Shift><F6> performs a 2 x zoom and filters the data before displaying it.
- <Shift><F7> performs a 4 x zoom and filters the data before displaying it.
- <Shift><F8> performs an 8 x zoom and filters the data before displaying it.

Once the image has been zoomed, the cursor moves from the main Sonar Display Window to the centre of the Zoom Window. The operator can then move the cursor around within the Zoom Window. If the zoom was not quite in the right place, or if the operator wishes to re-zoom with a different magnification factor, then this can be done from within the Zoom Window. Simply place the cursor in the required position and press the relevant zoom key.

7.3.1 The Tab key (Moving between Sonar Display and Zoom windows)

At any time the operator can toggle between the main Sonar Display Window and the Zoom Window by pressing the <TAB> key.

7.3.2 Re-Zooming to a different frequency

It is quite usual for the operator to wish to look at a particular, zoomed sonar contact in all three 'frequency' configurations (100 kHz, 500 kHz and Merge). With SonaView this can be done very simply without having to switch the cursor back to the main Sonar Display Window. Assume for the moment that the current frequency is 100 kHz and a possible contact has been zoomed x 4 using the <F7> key. To view the corresponding piece of 500 kHz data, simply press <F1>, which will replace the data on the Sonar Display Window. Now the data on the Sonar Display window is 500 kHz, but the data in the zoom window is 100 kHz. Press <F7> again, which will replace the 100 kHz zoom image with its 500 kHz equivalent.

Chapter Eight: Moving around the Optical Disks

8.1 Introduction

The 400 megabyte optical disks used by the SIDA system have sufficient capacity for approximately 112000 sonar records. With a typical 100 metre range scale setting, this corresponds to a recording time of over four hours. Depending on the circumstances it may not be necessary for the operator to replay certain parts of the disks. It is therefore necessary to provide the operator with tools to enable him or her to move around the disks quickly and efficiently. There are three methods available for the operator to select a new location from which SonaView replays the sonar data. Each of the methods is designed to address particular circumstances. There is a specific menu dedicated to the task of moving around the disks, but for the experienced operator, the three options can also be accessed via hot keys.

8.2 The Move to New Record Number Menu

There will be circumstances when the operator knows exactly to which point on the optical disks he or she wants to move. This would be the case, for instance, if an analysis session was being resumed and the operator had taken note of where the previous session had been terminated.

The Move to New Record Number menu is accessed via the key sequence <ALT>M,N or via the hot key 'N'. (There are actually two menus for which the hot key has been disabled. In these menus the key has been re-allocated for other purposes.) This brings up a composite radio button/numerical input input box which takes the form of Figure 8.1.

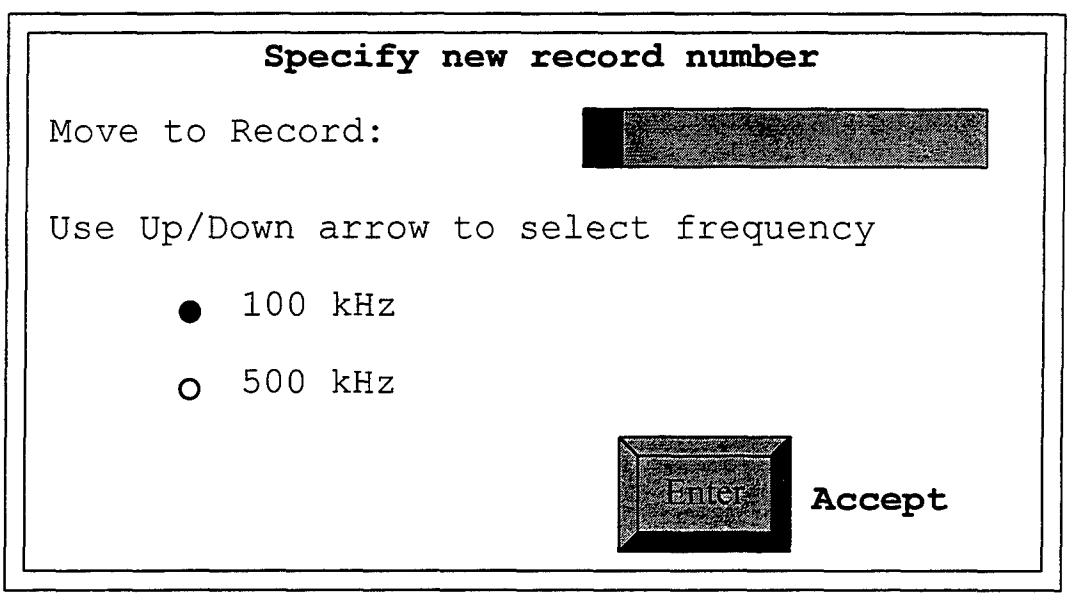

Figure 8.1 The Move to New Record Number input box

The record number can be in the range 0 through to 112000 approximately. If only one disk is loaded and a number is specified which exceeds the actual recorded data, an error message is displayed and the input box is re-presented so that the operator can make another selection. If there are two disks loaded, then it is also necessary, via the radio buttons, to specify which disk the specified record number applies to. In this case, if an invalid record number is specified then the program will jump to the next position in the sonar survey for which data is available for both frequencies.

8.3 The Move from Position in Abstract Menu

This menu is of particular use in jumping past sections of the survey which are of no interest or relevance to the operator's post-processing task. Examples of such sections may be the end-of-runline turning area in which the tow vessel was setting itself up for the next recording leg.

The abstract move menu is accessed via the key sequence <ALT>M,M or via the hot key 'M'. [1] If there is only one disk loaded then the Move From Position in Abstract menu is brought up directly. If there are two disks loaded, then before activating this menu, a radio button input box is displayed which gives the operator the option to select which disk's abstract is to be used. Once the selection has been made, a number of changes are made to the chart display on the Navigation Window:

- The existing vessel and towfish snail-trails are removed
- The outline of the vessel is removed
- The cursor is removed
- The towfish icon remains on the screen
- The chart is re-drawn to fit the entire abstract onto the screen.

Meantime a new menu is presented on the Parameter Window, as illustrated in Figure 8.2. Note that this menu gives the option to pan and zoom the Operations Plot on the Navigation Window, thus allowing the operator to 'focus in' on a position of interest. If the <UP ARROW> key is held down then the towfish symbol moves along the abstract in the forward direction and the 'new record number' field in the parameter display increases. Holding down the <DOWN ARROW> key moves the towfish symbol back towards the start of the abstract and the displayed record number decreases.

Once the operator is satisfied with the new record location, the <ENTER> key is struck. The Navigation Window is then restored to its original format and the sonar data begins to be read from the new disk location(s).

8.4 The Go To Current Sonaview Target/SIDA Contact option

If the current cursor referent is a SonaView Target or a SIDA Contact, then a third option becomes available to the operator. This option is accessed via the key sequence

[1] There are a small number of specific menus for which this hot key has been disabled as the key has been re-allocated for other purposes. This situation is indicated when the menu screen shows the 'M' key assigned to a different function.

<ALT>M,G or via the hot key 'G'. In this case the program will jump to a point 200 records before the target or contact and play from there. This gives a convenient lead-in period to allow the operator to develop a 'feel' for the prevailing background conditions before the object of interest is displayed.

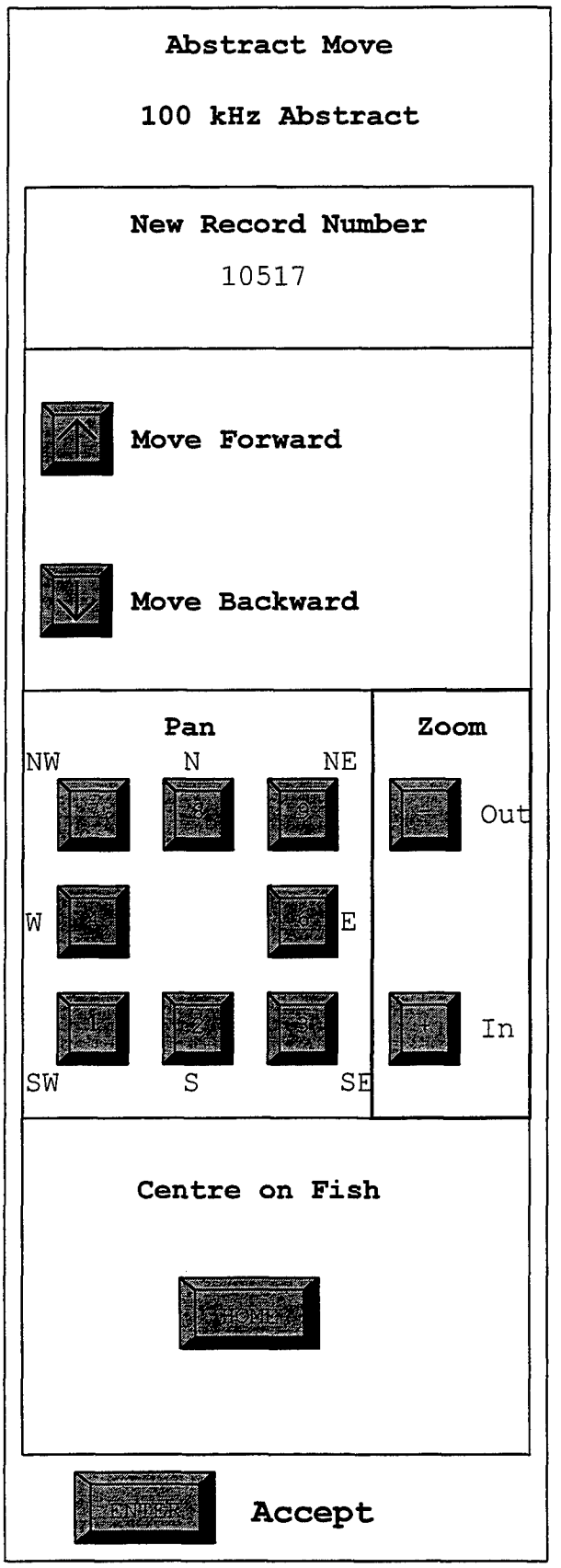

Figure 8.2 The Move From Position in Abstract Menu

Chapter Nine: Targets and Contacts

9.1 Introduction

One of the main functions of Sonaview, when it is used as a MWRS tool, is to enable the operator to mark or identify targets and to pass the coordinates and other details over to a geographic information system for integration with other operational data.

Section 3.3.7 introduced SonaView's Target Output File in which the data arising from a post-processing session are stored and via which data will ultimately be passed over to a GIS. SonaView has a number of features which are designed to help the operator fulfil this vital aspect of post-processing. With SonaView the operator is able to mark targets and classify them into one of several categories, to review previously marked targets, and to delete targets which are deemed to have been 'false positives'.

The Navy's existing SIDA route surveillance system allows the sonar operators to make preliminary identification and classification of possible targets during the data collection stage. These preliminary identifications are stored as Contacts on the SIDA optical disks. As sonar data is replayed, SonaView will alert the post-processing operator to the existence of such contacts as they scroll onto the Sonar Display Window. It is also possible for the operator to review the contacts one at a time via the Go To Current Sonaview Target/SIDA Contact option described in Section 8.4. Because the SIDA contacts are written permanently onto WORM (Write Once Read Many) cartridges, they can not be deleted. It has been my observation that the on-board sonar operators are quite good at detecting possible targets, but they are somewhat variable in the exact position where they place the SIDA cursor when they mark the contacts. (This may be because the SIDA places the contact number right on top of the cursor, thus effectively obliterating the contact if it is marked in the exact centre). Because of this variability, it was decided *not* to make a facility for directly converting SIDA contacts into SonaView Targets. Thus, while the post-processing operator can review SIDA contacts, it is still his or her responsibility to make a new target if the contact is deemed to warrant saving.

In Section 4.6 it was stated that each target file is assigned a unique Target File ID Number. No other target file will ever carry that ID number (at least until there have been over 65536 target files created!). Within a particular Target File, each target which is marked is assigned a Target Number. Each and every target therefore has a combination of the two numbers - Target File ID Number and Target Number - which is unique to that target. For example, if the Target File ID Number is 121 and the target is the 35th target marked within that file, then it can be specified via the identification sequence 00121-00035. No other target will ever carry that sequence. Even if this target is deleted the sequence will not be re-used. This approach was adopted to allow for the possibility that later versions of SonaView will have the ability to restore targets which have been deleted by the operator.

9.2 Marking a Point Target

If in the course of a post-processing session, the operator finds a sonar hit which comprises a localised, discrete object, then the following steps are required to mark it as a target:

- Place a 'rubber band' around the target, as illustrated in Figure 9.1a-9.1d
- Upon releasing the left mouse button, a target selection menu will be displayed, as illustrated in Figure 9.2. Select the most apt target description. Note in this example, the previous target had been a 'Test' target but the new target is being identified as a 'Small object with shadow'
- If a mistake has been made, then hitting <ESC> at this point will return to the normal display, otherwise hitting <ENTER> will accept the target
- A new input box is displayed asking the operator for any remarks or comments. Type the remarks, finishing with <ENTER>. If no comments are needed, then simply hit the enter key without typing anything.
- If the target is identified as having a shadow, a third message box will be presented, inviting the operator to use the <LEFT ARROW> or <RIGHT ARROW> keys to move a vertical black line to the extremity of the acoustic shadow, as shown in Figure 9.1e and 9.1f. Once the line is appropriately aligned, the operator should press <ENTER> once more.
- At this point a contact number is assigned to the target, and this number is presented on both the Sonar Display and Navigation Windows. (This feature can be over-ridden by the operator).

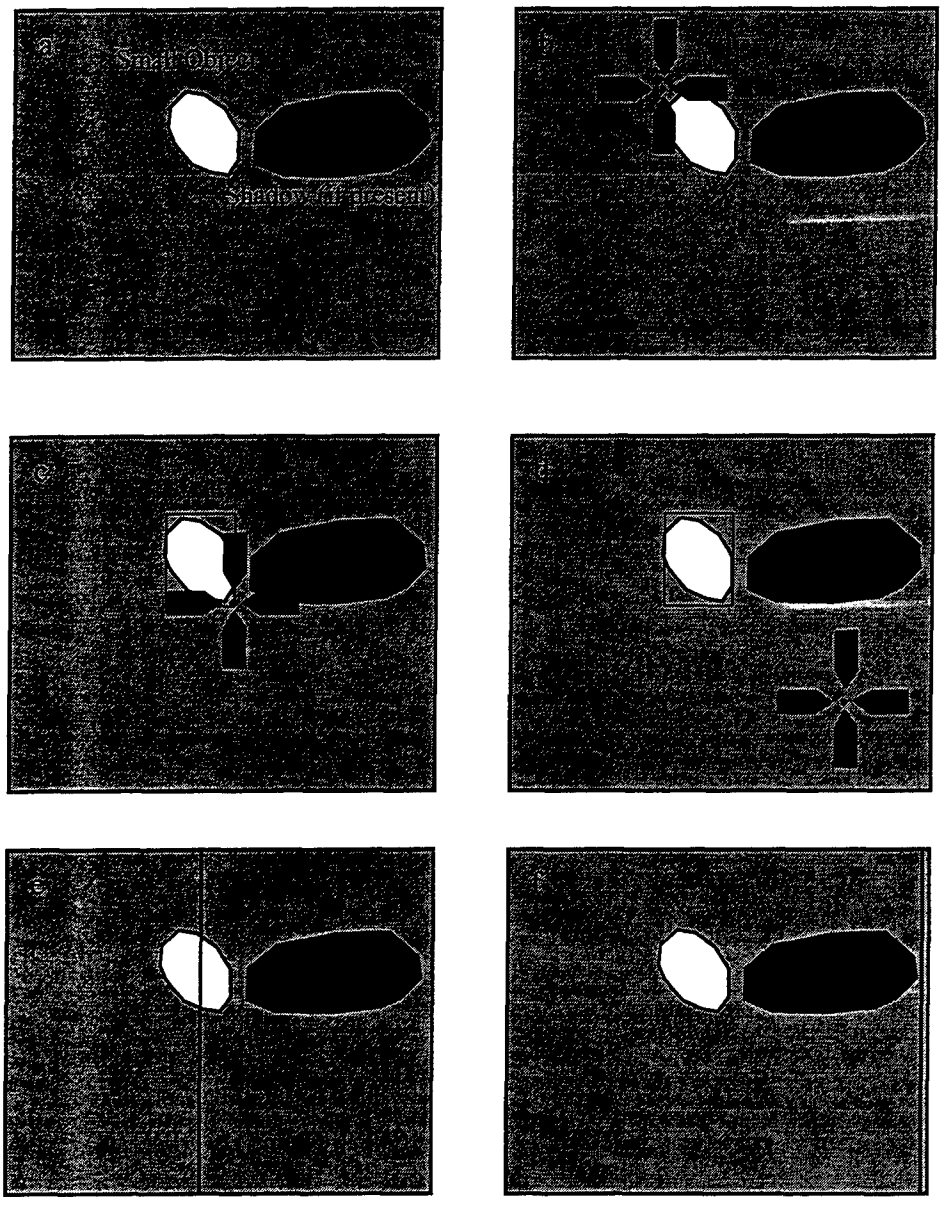

Figure 9.1 Marking a point target
a. Assume that the object has a strong return and a distinct shadow
b. Place the cursor at the top left of the object, depress and hold the left mouse button
c. 'Swipe' the cursor across the object until the rubber band just encloses it, then release the mouse button
d. At this point the cursor can be moved away from the target
e. If there is a shadow, the cursor is replaced by a long black line
f. Using the <RIGHT ARROW> key, move the line across to the extremity of the shadow, then hit <ENTER>

The following target types are defined as point-type targets:

- Test
- Object of interest
- Small object with shadow
- Small object, no shadow

- Large object (solitary)

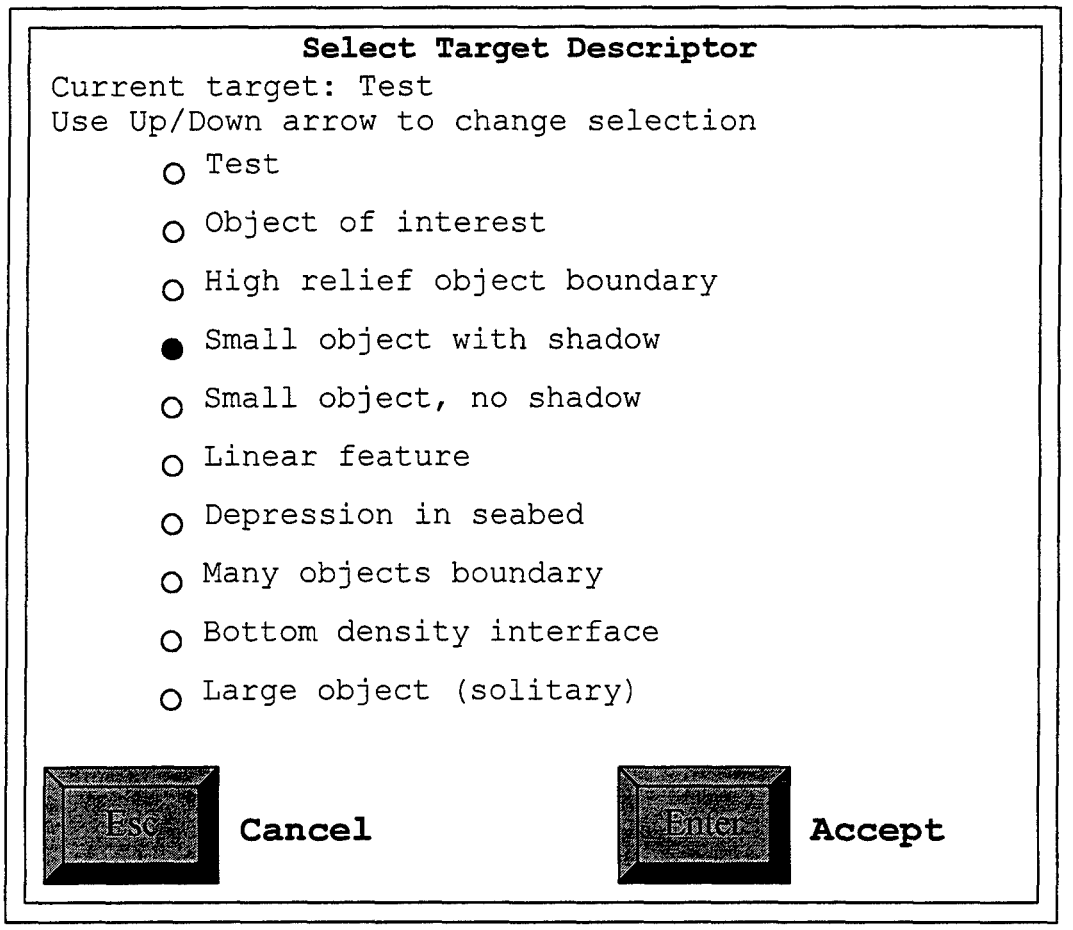

Figure 9.2 The select target type input box

9.3 Marking a Polygon Target

A polygon target is one which is not localised as a single object, but is rather of a spatially extended or diverse nature. The currently defined polygon targets are:

- High relief object boundary (eg, an isolated rock shelf)
- Linear feature (a pipeline is a good example)
- Many objects boundary (eg, a group of coral outcrops)
- Bottom density interface (e.g. the interface between two sand types)

A polygon target is defined by a series of lines joined end to end. The ends of the lines are called 'nodes' and Sonaview stores the target by specifying where the nodes are. To mark the polygon target, the operator marks each node by making a rubber band box around each point. The size of the boxes doesn't matter, but their centres must be at the points where the lines start and end. SonaView assigns a number to the target as for the point target, and this number is displayed next to the first target node, as illustrated in Figure 9.3.

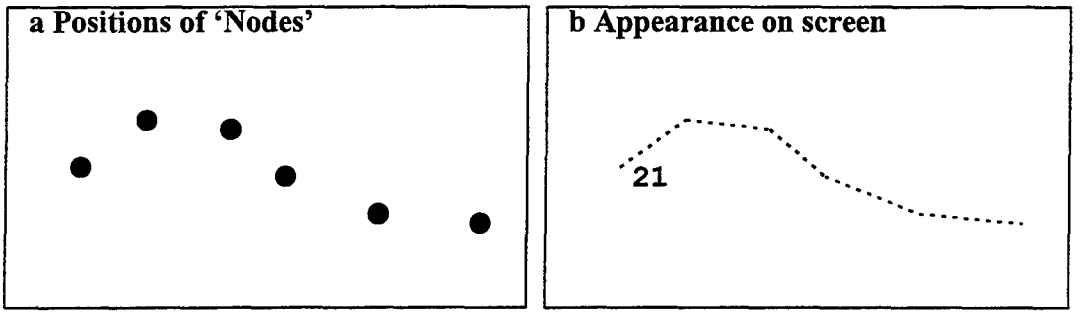

Figure 9.3 Illustrating the positions at which an operator marks 'Nodes', and how the target appears on screen.

The following sequence creates a polygon target:

- To start a polygon target, create a rubber band box around the first point, eg at the end of a boundary between sand and rock, the same as for a point target.
- When the 'Select Target Descriptor' input box appears, select a polygon target type such as 'bottom density interface'. The program will ask for remarks, as for a point target, but pressing <ENTER> won't exit target marking mode.
- A message will be displayed for a short time advising the operator to continue marking nodes as shown in Figure 9.1b and 9.1c, using a rubber-band box around each node. As each node is marked, a tone is sounded and a line will be painted on the Navigation Window.
- When all nodes have been marked the operator should press the *right* mouse button to finish the feature. The computer will sounder a higher-pitch, termination tone at this point. It has been noticed that, very occasionally the right button click is missed by the computer. If this happens, then click it again.

9.4 The target menu

This menu has options which allow the operator to decide how much processing is to be done on a marked object, to view details of the currently selected target or contact, delete a target and initiate an experimental auto-detection algorithm.

9.4.1 Selecting SonaView Target analysis mode (<ALT>T, T)

SonaView was originally written as a scientific analysis tool. For this reason it has some features which are unlikely to be of interest to Navy. One such feature is the target analysis mode selection feature. The default mode is called the 'Navy IPS' analysis mode. When this mode is selected the program only writes target information to the target file with a .REC extension. If the second, 'DSTO Targets' mode is selected, then additional information is written to files with .POS and .CEN extensions. While it will cause no harm to use this mode, the only real outcome will generally be to clutter the hard disk for no useful return. The third analysis mode, 'Sub-Bottom Profiler' has not been implemented and the program will not let the operator select it.

9.4.2 Displaying SonaView Target/SIDA Contact Numbers (<ALT>T,N)

From time to time it is desirable to stop the computer from displaying contact numbers. An example would be if it was desired to do a hard-copy printout of the Navigation Window (as described in Section 6.8), in which it was desired to illustrate the basic distribution of targets and contacts without cluttering the plot with excessive detail. This option is a simple toggle which turns the contact/target numbers on ('Show Contact Numbers') or off ('Suppress Contact Numbers').

9.4.3 Deleting the current SonaView target (<ALT>T,D)

This option is used to delete a previously-marked SonaView target. This feature gives an operator the freedom to adopt a two-stage target marking procedure. In the first stage the operator can mark all potential targets, including ones about which he or she is unsure. Then in a second, review stage, if it is decided that the target was a false alarm, it can be deleted as follows:

- Select the target as the current cursor referent. It will be highlighted on the Navigation Window with a yellow circle (Section 5.2.3)
- Type the target delete sequence <ALT>T,D
- If there are any targets remaining, SonaView will give the operator the option to select which target is to be the new cursor referent

9.4.4 Displaying the details of the current SonaView target or SIDA contact (<ALT>T,C)

When a target or contact is selected as the current cursor referent, its details are copied into the computer's memory. This option allows the operator to view a summary of these target details. Depending on whether the cursor referent is a SonaView target or a SIDA contact, different details are available.

9.4.4.1 SonaView Target Details

A sample SonaView Target Detail message box is illustrated in Figure 9.4. Note that the following details are presented to the operator:

- Target number and type code
- 100 kHz disk serial number and record number (blank if none)
- 500 kHz disk serial number and record number (blank if none)
- Target offset from midline, in metres
- UTM easting and northing
- Latitude and longitude
- Target width, length and height (blank if no shadow to estimate height)
- Remarks field

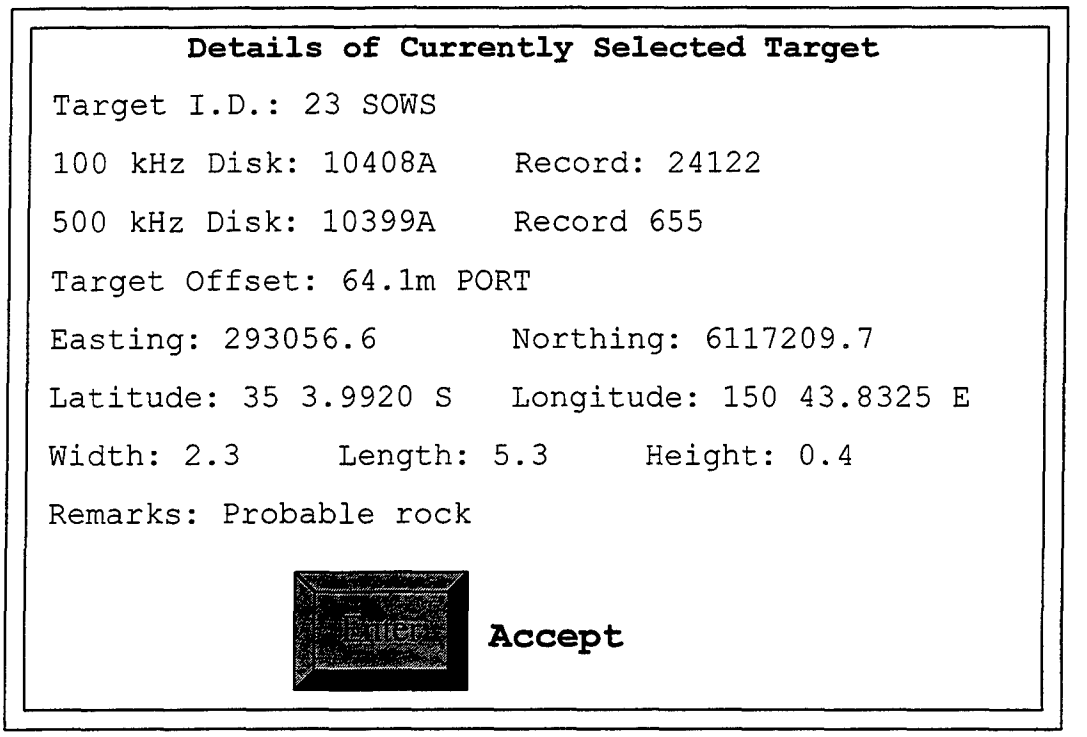

Figure 9.4 Displayed details of a hypothetical SonaView target. Note that the code 'SOWS' stands for Small Object With Shadow as defined in Section 3.3.7.2

9.4.4.2 SIDA Contact Details

The SIDA Contact Details message box is similar to that for SonaView targets, but a more restricted range of information is available, as follows:

- Contact number, as allocated by the Quils navigation control system and type code (0 - 9)
- 100 kHz disk serial number and record number (blank if none)
- 500 kHz disk serial number and record number (blank if none)
- Contact offset from midline, in metres
- UTM easting and northing, as calculated by the SIDA unit

Figure 9.5 is an illustration of a hypothetical SIDA contact message box. Note that, despite the fact that in this example the Record numbers and offsets are exactly the same as for the SonaView target in Figure 9.4 (something which is not likely to happen in operational practice - there will almost always be slight differences between the locations where any two operators will place the centre of a target or contact), the positions are shown as slightly different. This is because, in calculating contact positions, the SIDA uses different (and inherently less precise) algorithms than those used by SonaView.

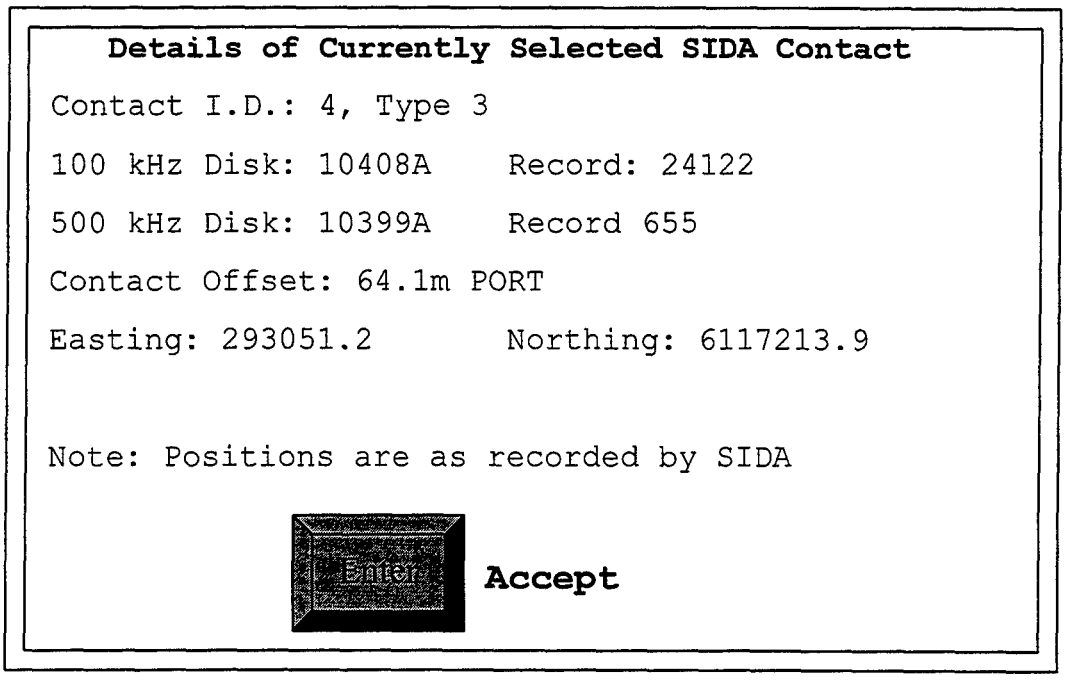

Figure 9.5 Displayed details of a Hypothetical SIDA contact.

This is probably a good place to repeat the message that, in order to convert a SIDA contact into a SonaView target, the operator must re-mark the object of interest, as described in Sections 9.2 and 9.3.

9.4.5 Options for auto-detection of targets.

The auto-detection features of SonaView are very developmental in nature and are not intended to be used operationally.

9.5 Copying target information to a GIS

At the present time it is envisaged that SonaView target information which is stored in the target files will be passed over to a GIS such as ARCVIEW. The physical transfer will be done via 3.5 inch floppy disks and COMAUSMINDIVFOR will be responsible for writing the translation routines to enable the information to be read into the GIS.

Assume for the moment that it is desired to copy the (mythical) target file TRIAL97A.REC from the mission directory **DSTOTR97** onto floppy disk. This copying is done from DOS as follows:

- Change to the mission directory by typing `CD \DSTOTR97<ENTER>`
- Place a floppy disk into drive A:
- Type the line `COPY TRIAL97A.REC A:<ENTER>`

The above sequence will place the copied file into the root directory of the floppy disk.

9.6 Obtaining a paper print-out of target details

Because each line of the target file has a potential length of 255 characters, it is difficult to obtain a hard-copy print-out of the standard file. A small DOS utility program has been written which re-formats the target details into a more readable form, and outputs it to a printer attached to the port LPT1. Let's continue the example which was introduced in Section 9.5:

- Ensure that the parallel printer is turned on and attached to the correct printer port
- move to the mission directory containing the target file which is to be output by typing `CD \DSTOTR97<ENTER>`
- Start the program by typing `PRINTTGT<ENTER>`
- The program will prompt the operator for the target file name. No extension need be typed, so in the current example the operator simply responds by typing `TRIAL97A<ENTER>`
- A full print-out of the target details will be produced. As each target requires several lines of print-out, if there are a lot of targets, the print-out will require quite a large amount of paper.

Chapter Ten: General Options

10.1 Introduction

SonaView has a small number of miscellaneous options which don't readily fit into any specific main menus. These have been assigned to the General Options Menu. In its current form SonaView has General Options for:

- Changing the UTM Zone
- Selecting which towfish tracking methodology is to be used
- Over-riding the SIDA unit's estimate of towfish height

It is planned that later versions of the software will also have the ability to switch between different geodetic standards (AGD84, WGS84 etc) and to run a range of diagnostic tools. These planned-for options are shown as Inactive icons in the General Options menu. They have not been implemented and therefore cannot be accessed.

10.2 Changing the UTM Zone (<ALT>G,U)

For the purpose of producing UTM projections, the earth's spheroid is broken down into 60 sectors, each with a longitudinal extent of six degrees. Each sector has a designated UTM Zone number. The Australian mainland occupies Zones 49 (western extremity) through 56 (eastern extremity).

Generally the operator will not need to worry about specifying the UTM Zone, as the charts which have been digitised by Maritime Operations Division have an in-built UTM Zone designation.

If, however, SonaView is being operated without a chart file, and a survey has been conducted in a zone other than the default (Zone 56), it is necessary for the operator to specify the UTM Zone. If this is not done, then SonaView will incorrectly convert the navigation positions between the UTM Eastings/Northings representation and the Latitude/Longitude representation.

A new UTM Zone is input via the New Zone Number input box which, in turn, is accessed from the General Options menu. The keystroke sequence for activating this input box is <ALT>G,U, and the operator is simply required to enter a whole number with value in the range 1-60.

10.3 Selecting the towfish tracking methodology

10.3.1 Introduction

The standard route surveillance system uses an ultra-short baseline acoustic tracking system (USBL) to monitor the towfish position relative to the tow vessel. The standard USBL is the ORE-Feranti Trackpoint II system.

The USBL uses a transponder arrangement to track the towfish. An acoustic transmitter/hydrophone unit is mounted on the tow vessel and an acoustic transponder beacon is mounted on or near the towfish. The hydrophone unit actually has three small hydrophones mounted in a triangular array. The term ultra-short baseline is indicative of the fact that these hydrophones are very close together.

The tracking is done as follows:

1. The hydrophone unit transmits an initiation pulse
2. If the beacon detects the initiation pulse then, after a fixed delay (turn-around time) it transmits an acknowledgement signal.
3. The beacon also has an in-built depth sensor. It uses a second acoustic pulse to telemeter depth information back to the USBL. The time difference between the two pulses is proportional to the beacon depth.
4. If the hydrophone unit detects the beacon's response it subtracts the turn-around time from the total transmission-reception time and then calculates the slant range to the beacon.
5. By comparing the time-of arrival of the transponded signal at each of the hydrophones, the system can calculate the bearing to the beacon.
6. Assuming that the hydrophone unit also receives the depth telemetry pulse, it can also calculate the depth of the beacon.
7. By combining depth and slant range, the USBL is able to calculate the horizontal layback to the beacon

If an error occurs in any part of this tracking sequence, then the USBL's estimated position for the beacon will be rendered unreliable. Depending on the nature of the error, the horizontal layback estimate may be incorrect, the measured bearing to the beacon may be incorrect, or both may be incorrect. While the USBL filters out many of these 'bad fixes' across a large number of trials it has been observed that a significant number still get transferred to the navigation control system.

Experience over several years has also shown that the Trackpoint II has a somewhat intermittent performance envelope: sometimes it works for a full survey, sometimes it works intermittently during a survey and sometimes it doesn't work at all. SonaView has a number of options available to allow the operator to compensate for partial or complete loss of tracking by the USBL. These options are accessed via the Towfish Tracking radio button input box which is found in the General Options Menu (keystrokes <ALT>G,T). Functional descriptions of each of the options is provided in the following sections.

10.3.2 Full Trackpoint II tracking

With this option the towfish position is presented exactly as stored on the optical disk. It is assumed that the USBL has been fully functional and no checks are made on its position estimates.

10.3.3 Using Trackpoint II layback only

From the above functional description of the USBL, it can be seen that one of the critical elements of the tracking process involves estimating the bearing to the transponder beacon. It has frequently been observed that the Trackpoint II is producing realistic estimates of towfish layback, but not calculating the bearing reliably. One of the Towfish Layback options lets the operator select 'Trackpoint II Layback only'. In this case the bearing to the towfish is calculated using a 'Follow the Dog' (FTD) algorithm[2]. While this algorithm is subject to errors when a survey is conducted in the presence of a significant cross-current, it generally yields reasonable estimates of the bearing to the towfish.

10.3.4 Rejecting unrealistic Trackpoint II fixes

Like one or two of the other options in SonaView, this option is subject to ongoing development. At present the program simply looks to see if the layback is unrealistically small (less than 10 metres - which would place the towfish onto the deck of most tow vessels). If the layback is reasonable, then the USBL towfish position estimate is used as is. If the layback is deemed to be unrealistic, then the towfish position is calculated using a combination of the FTD algorithm and the last valid Trackpoint II layback.

This is the default setting for SonaView. If, however, this option has been disabled at any time, it can be re-selected by placing the input box 'bullet' on the 'Ignore bad Trackpoint II laybacks' selection button.

---

[2] See Poeckert, R.H. (1991) An algorithm for estimating the position of a towfish, Defence Research Establishment Pacific, Technical Memorandum 91-12.

The FTD algorithm assumes that the towfish is connected to the ship via a rigid tow-bar which is free to pivot in two dimensions about the tow-point. The algorithm is illustrated in Figure 10.1. At fix number $n+1$ the towfish lies along the straight line joining the tow point at fix $n+1$ and the towfish position at fix n. Assume that the layback to the towfish is a fixed distance L, then the towfish will lie along that line a distance L from the tow-point.

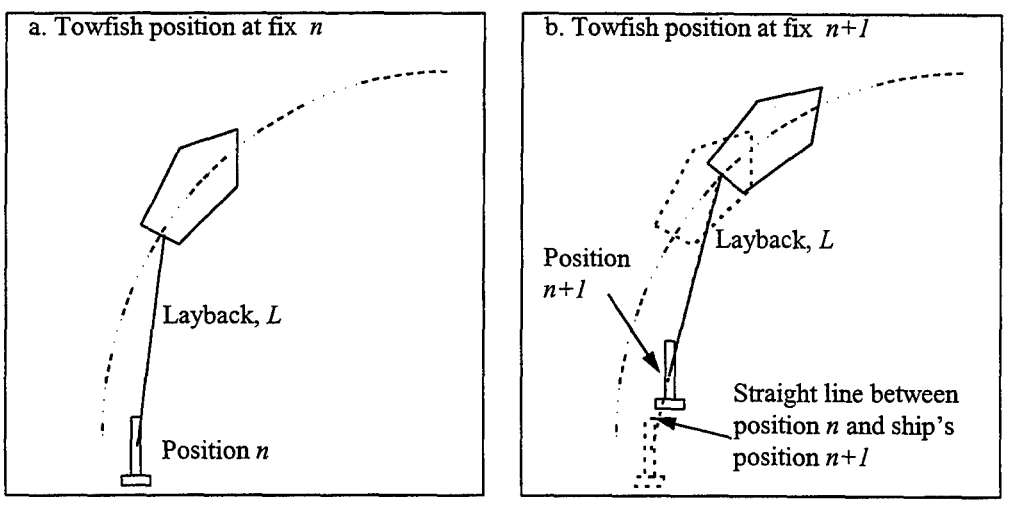

Figure 10.1 The 'Follow the Dog' algorithm

10.3.5 Using a manual layback

If it is decided that the USBL data is unusable, then it can be ignored completely. In this case the operator should select the manual layback option. When this option is selected, a dialog box asks the operator to input a manual layback in whole metres. From that time on the specified layback will be used, in conjuction with the FTD algorithm, to calculate towfish position.

10.4 Over-riding the SIDA's estimate of towfish height

10.4.1 Introduction

The SIDA system uses an in-built algorithm to make an estimate of the current height of the towfish above the sea-bed. When collecting slant range corrected sidescan sonar data, it is of critical importance that this height estimate be correct. Reference to Figure 7.1 may help the reader to appreciate this point. If the height is estimated incorrectly, then sampling will not start directly below the towfish. If the estimated towfish height is too small, then some of the water column will be included as sea-bed. If the height estimate is unrealistically high, then some of the sea-bed will be missed. The former situation sometimes occurs when the system is being operated in relatively shallow water, resulting in the towfish being closer to the surface than to the bottom. In this case, the SIDA may 'lock onto' the first surface return rather onto the first bottom return. The latter situation can occur if the sonar is being operated over soft mud. In this case the first sea-bed return may be too weak to be discriminated by the SIDA. At the present time the operator has two choices in selecting towfish height: (a) using the SIDA height estimate; (b) entering his or her own estimate manually. This is another area in which the SonaView program is under development. It is planned that, in the future, it will also be possible to select an alternative, autonomous towfish height tracker.

The Towfish Height command is located in the General Options menu. It is activated with the keystroke sequence `<ALT>G,H`.

10.4.2 Checking the towfish height

If it is suspected that the SIDA may not have locked onto the sea-bed correctly, then a check can be made very easily:

1. the SIDA's estimate of towfish height is presented on the Sonar Status Window under the heading 'Fish Height (m):'
2. select the 'Water Column' sonar display format, as described in Section 7.2.2
3. place the cursor on the first sea-bed return
4. read the actual towfish altitude off the Cursor Data Area of the Sonar Status Window (again see Section 7.2.2). This is presented in the Cursor Offset/Depth/Height field.

The SIDA height read at Step 1 should agree with the height measured at Step 4 to within 0.5 metres. If this is not the case, then the manual height option can be selected.

10.4.3 Setting a manual height

Activating the Towfish Height command in the General Options menu causes a radio button input box to be displayed. This allows the operator the choice between using the SIDA's height or a manually-entered height. If the manual height option is taken, then a dialog box is displayed, requesting that the operator enter a new towfish height, which must be entered in whole metres. When entering a manual height simply round the towfish altitude, as estimated in step 4 of Section 10.4.2, to the nearest whole metre.

Chapter Eleven: Quick Guide

11.1 Introduction

At this point in the manual it is assumed that the operator is now familiar with the capability and operation of SonaView. It is recognised, however, that it takes considerable operational experience with the program before the operator feels completely familiar with it. This section contains recipes for performing some of the more commonly-required operational procedures.

11.2 Setting up to analyse a survey

At the termination of a survey, there may be several pairs of optical disks. Normally the 100 kHz disks need to be crunched.

To crunch the disks (see Section 3.3.1):

1. Change to the abstract directory `CD \ABSTRACT<ENTER>`
2. Insert an optical disk in drive 1
3. Run program ABSTRACT `ABSTRACT<ENTER>`
4. Respond to each question from the program by typing `<ENTER>`
5. Wait approximately one hour for the program to finish
6. Repeat steps 2-5 for each of the 100 kHz disks.

Now a mission directory needs to be created, using the example from Section 3.2.2, assume that the directory is to be called **AUS236**:

1. Go to the root directory: `CD \<ENTER>`
2. Make new directory: `MD AUS236<ENTER>`
3. Go to new directory: `CD \AUS236<ENTER>`

The next step is to create an abstract summary file (Section 3.3.2.2) To start an abstract summary file called AUS236.SUM in the mission directory, type

```
EDIT AUS236.SUM <ENTER>
```

The "Edit" program will start, giving a blank blue screen. Now type in the abstract files for the mission, which will be of the form:

```
C:\ABSTRACT\12345A.ABS<ENTER>
C:\ABSTRACT\12345B.ABS<ENTER>
C:\ABSTRACT\12346A.ABS<ENTER>
C:\ABSTRACT\12346B.ABS
```

To save the file, hit the `<ALT>` key, which will present a menu. Use the arrow keys to highlight `Exit` and hit enter. The edit program will ask you if you want to save the file and exit, or discard changes and exit. Choose Save File and Exit and press `<ENTER>`.

It is now time to enter SonaView by typing SONAVIEW<ENTER>

The final steps in the survey set-up procedure are to create a mission file and add runlines to it. Assume that the mission file is to be called AUS236.LOG:

1. Open the File Menu by typing <ALT>F
2. Select the Mission File command by pressing the 'M' key
3. Enter the new file name AUS236.LOG<ENTER>
4. Now enter the Runline/Waypoint Sub-Menu by pressing the 'E' key.
5. To create runlines, press 'R' and enter the start/end coordinates of the main line, plus the number of lines on each side and line spacing.
6. Repeat step 5 for each laptrack in the survey

The survey is now ready for analysis.

11.3 Resuming analysis of a survey

This section assumes that the set-up procedure described in the preceding section has been followed in a previous session and that SonaView has been shut down in the interim period. The operator is now in a position to re-start SonaView and begin an analysis session. The steps are described in detail in Chapter Four. The same example file names will be used as those used in Section 11.2:

1. Change to the mission directory CD \AUS236<ENTER>
2. Start SonaView SONAVIEW<ENTER>
3. Open the File menu <ALT>F
4. To open the chart file AUS236.CHT type 'C' then AUS236.CHT<ENTER>
5. To open the mission file type 'M' then AUS236.LOG<ENTER>
6. To open the abstract summary file type 'A' then AUS236.SUM<ENTER>
7. Now open the target file, called for example BRIS97, type 'T' then BRIS97<ENTER>
8. Finally change to the Work Window by typing <ALT>R

SonaView is now ready to resume analysis.

11.4 Moving to new locations on the optical disks

There are three methods for moving to a new location in the survey, described in detail in Chapter Eight. Each method has an assigned hot key:

- New record number, hot key 'N', lets the operator specify a number from 0-112000 (approximately) which is the record location on the optical disk.
- Abstract move, hot key 'A', lets the operator select the new replay location by working off an abstract of the optical disk's navigation updates
- Go to next SonaView Target/SIDA Contact, hot key 'G'. Moves to a location 200 records before the currently selected target or contact. This function is disabled if there is no target or contact selected. Target/contact referent type is selected via the hot key <END>. The particular item is interest is selected as the chart referent via the hot key <INSERT>.

11.5 Marking targets

The procedures for marking targets are described in great detail in Chapter Nine. Essentially, though, the procedure involves the operator placing the cursor on the top-left of the object to be marked, pressing and holding down the left mouse button, 'swiping' across the object to enclose it fully in a red, rectangular outline and releasing the mouse button. From that point SonaView will guide the operator through the steps required to complete the target marking procedure.

11.6 Exiting from SonaView

To shut down the program simply type 'Q' or <ALT>F, X. The program will close all of its working files and then return to DOS.

11.7 Transferring target data to a GIS

With the current version of SonaView it is intended that data transfer to a GIS should take place via floppy disk. This process is described in Section 9.5 and substantially repeated here.

Assume for the moment that it is desired to copy the (mythical) target file TRIAL97A.REC from the mission directory **DSTOTR97** onto floppy disk. This copying is done from DOS as follows:

- Change to the mission directory by typing CD \DSTOTR97<ENTER>
- Place a floppy disk into drive A:
- Type the line COPY TRIAL97A.REC A:<ENTER>

Appendix 1: Hot Keys

Key	
<F1>	Select displayed sonar frequency
<F2>	Select sonar screen (displayed channels) format
<F5>	Zoom, Factor 1
<F6>	Zoom, Factor 2
<F7>	Zoom, Factor 4
<F8>	Zoom, Factor 8
<Shift><F5>	Filter Zoom, Factor 1
<Shift><F6>	Filter Zoom, Factor 2
<Shift><F7>	Filter Zoom, Factor 4
<Shift><F8>	Filter Zoom, Factor 8
<F9>	Waypoint Here
<F10>	Runline Begin/End
<END>	Select referent type
<HOME>	Re-centre Navigation Window on current cursor location
<INSERT>	Select new item as the chart referent
<PAGE DOWN>	Select previous item as the chart referent
<PAGE UP>	Select next item as the chart referent
<TAB>	Switch between main Sonar Display Window and Zoom Window
<CTRL><PRINT>	Print Navigation Window on Laser Printer
-	Zoom Navigation Window out
+	Zoom Navigation Window in
1	Move centre of Navigation Window south-west
2	Move centre of Navigation Window south
3	Move centre of Navigation Window south-east
4	Move centre of Navigation Window west
5	Re-draw Navigation Window
6	Move centre of Navigation Window east
7	Move centre of Navigation Window north-west
8	Move centre of Navigation Window north
9	Move centre of Navigation Window north-east
C	Change current sonar colour scheme
F	Select streak/grain filter
G	Go to next SonaView Target/SIDA contact
L	Select look-up table.
M	Move from position in abstract
N	Move to new record number.
P	Toggle between pause/scroll mode
Q	Quits (exits) from SonaView
R	Toggle between normal/review mode
S	Save Sonar Display Window to disk

Appendix 2: Specification for Target Output File Format

The Target Output File file is stored as an ASCII text file with each field separated by a comma. The fields are:

Data Field	Description	Typical Field width	Field format	Example
1	Target Type: Code	4	Text	MOBS
2	Survey Target Number	3	Integer	1
3	Target File ID number	3	Integer	121
4	SonaView mission filename	12	Text, Filename :8 Extension : 3	JervisBy.Log
5	Contact Easting	8	Real 8:1	123456.1
6	Contact Northing	9	Real 9:1	1234567.1
7	Contact Latitude	11	Composite	35 15.123 S
8	Contact Longitude	12	Composite	151 30.456 E
9	Sonar System	5	Text	K595
10	100 kHz Disk ID	6	Text	10041A (NUL if none)
11	100 kHz Record No.	6	Long Integer	110000 (NUL if none)
12	500 kHz Disk ID	6	Text	12345B (NUL if none)
13	500 kHz Record No.	6	Long Integer	109123 (NUL if none)
14	Offset in metres	5	Real 5:1	123.4
15	Side	4	Text	PORT or STBD (All caps)
16	Width in metres	4	Real 4:1	12.3
17	Along track length	4	Real 4:1	45.6
18	Aspect Length	4	Real 4:1	78.9 (NUL if not programmed)
19	Aspect Angle in degrees	5	Real 5:1	123.4 (NUL if not programmed)
20	Height	4	Real 4:1	12.3 (NUL if no shadow)
21	Nav Status	1	Byte	1, 2 or 3
22	Date	10	YYYY MM DD	1997 08 21
23	Time	8	HH mm SS	19 24 06
24	Datum	5	Text	AGD84
25	UTM Zone	2	Integer	56
26	Towfish Easting	8	Real 8:1	123456.1
27	Towfish Northing	9	Real 9:1	1234567.1
28	Towfish Depth in metres	5	Real 5:1	123.1
29	Towfish Altitude in metres	5	Real 5:1	123.1
30	Speed over ground in knots	4	Real 4:1	12.1
31	Vessel Easting	8	Real 8:1	123456.1
32	Vessel Northing	9	Real 9:1	1234567.1
33	Vessel CMG	5	Real 5:1	123.1
34	Remarks	20	Text	Comment

The following table gives a listing of the currently defined Contact type codes and contact types (Data Fields 3 and 4).

Contact Type	Contact Type Code	Explanation
Test	TEST	
Object of interest	OOI	
High relief object boundary High relief object boundary	HROBS HROBC	Start Feature Continue Feature
Small object with shadow	SOWS	
Small object, no shadow	SONS	
Linear feature Linear feature	LFS LFC	Start Feature Continue Feature
Depression in seabed	DIS	
Many objects boundary Many objects boundary	MOBS MOBC	Start Feature Continue Feature
Bottom density interface Bottom density interface	BDIS BDIC	Start Feature Continue Feature
Large object (solitary)	LOS	

At present there is only one sonar system available, the Klein 595, encoded K595. It is likely, however, that alternative sonars may become available in the foreseeable future, for instance the Klein System 5000 Multiscan (K5000), and so allowance is made for this eventuality.

The Nav Status data field has the following meanings:

Status Value	Meaning
1	Navigation OK
2	Navigation update delayed >10 seconds approximately
3	No valid navigation updates available

The datum field can be any one of the following: AGD84, AGD66, GDA94, WGS72, WGS84.

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Roger Neill

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19. ABSTRACT

The computer program 'SonaView' was written to provide a test and evaluation platform for evaluating a range of methods for post processing side scan sonar data. As part of the evaluative process, Royal Australian Navy personnel have been using the program operationally. This document is a detailed operator's guide which is intended to be used in conjunction with SonaView.